RAILROAD GAZETTE

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Contributions

The Engine-Mile and the Ton-Mile.

Chicago, July 23, 1902.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In reply to your question in regard to the use of the ton-mile basis for measuring the efficiency of engine service, I submit the following memorandum:

As the science of railroad operation develops, the value of a proper unit of comparison becomes more and more important. Heretofore, the engine mile has been the unit used to determine the relative expense of engine operation, as applied to the mechanical department, and the Master Mechanic, Superintendent of Machinery, or General Manager, has taken credit for economical results due to low cost per engine mile of fuel, oil and waste, repairs to engines, wages of enginemen, and other incidental expenses, connected with engine operation. Regardless of the fact that this unit of comparison has attained a certain respectability due to age, the writer considers it, in a large measure, misleading and vicious. If the conditions on any one railroad, or on all roads, were ideal and uniform, it would have more value; but with human nature constituted as it is, and conditions as they are, it is not a proper unit of comparison.

As long as the unit is engine miles there is a tendency on the part of every person connected with the Machinery Department to increase engine miles and diminish service rendered. The less number of cars hauled by an engine or the less amount of work done en route, the better showing can the engineman make as to expense of fuel, oil and waste, repairs, and other items incidental to the trip.

On the other hand, when the unit of measure is *work* or service performed by the engine, the Superintendent of Machinery, Master Mechanic and other officials are interested in closely watching to cut off unnecessary or light mileage, and are interested, even to the engineman, in hauling full tonnage. Consequently, instead of a division of interest between the mechanical and transportation departments proper, there will be unity of motive and interest.

The ultimate end of railroad construction, maintenance and operation is the largest possible net return. This net return is dependent upon the ability to handle traffic at the lowest possible cost, and in the movement of traffic, this is dependent upon the transportation of the greatest number of tons of weight for the least expenditure.

It, therefore, seems to the writer that the proper unit of comparison is not miles run by an engine, but tons hauled, and the unit of measurement should be the ton-mile or some multiple thereof. With this end in view, the railroad with which the writer is officially connected has adopted this unit of comparison to measure the performance of its locomotives. This comparison not only gives the relative efficiency of the different types of engines, but also of the various master mechanics and, in turn, Division Superintendents, to whom the former report wholly, or in part.

The figures brought out by a comparison of the old and new units are most valuable and interesting. In a general way, it has developed that the engine which had shown the most economical results under the old practice of engine miles, frequently shows the poorest results when the ton-mile measure is applied.

One particular class of engines during the month of May showed a total cost per engine mile of 20 cents, and a total cost, per thousand ton-miles, of 62 cents. On the other hand, a class of engine showing 24 cents per engine mile, showed a cost per thousand tons of gross train weight hauled one mile of 26 cents. It is, of course, understood that in order to intelligently use figures of this kind, it is necessary to be familiar with all the conditions surrounding the problem; the density and direction of traffic, gradients, and all the other factors connected with it, must receive careful and intelligent consideration.

The application of this measure to different classes of engines used on the same division, and under like conditions, brings out and emphasizes in the highest degree the relative economical merit of the different classes of engines, and in a practical way which cannot be questioned. After the relative factors on the different divisions of any railroad system have been carefully determined by experience, it forms a measure not only to determine the efficiency of the different classes of engines, but also the efficiency of the personnel, in both the mechanical and transportation departments. The writer firmly believes that the use of this measure of comparison would result in a largely increased economy and efficiency on any railroad system to which it might be applied.

It should, of course, be thoroughly understood that the basis of this system is accurate wheel records in order to properly determine the actual tonnage or gross weight hauled.

JOHN F. WALLACE.

Frozen Train Pipes and the Remedy.

Cincinnati, New Orleans & Texas Pacific Railway, Ludlow, Ky., July 26, 1902.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the proceedings of the air-brake convention at Pittsburgh, published in the *Railroad Gazette* of July 18th, the paragraph containing my remarks is not correct, and is misleading.

The return pipe was put on the *opposite end* of the reservoir from the discharge pipe, and not on the discharge end. It is this that makes the difference and precipitates the moisture.

We have worked all along on the theory that it is cooling the air that precipitates the moisture, but while this may be true, in some cases it does not apply here. The real principle is, that if a current of moist air be thrown directly against a plate at a high velocity, the moisture will strike the plate, cling to it, and condense there, while the air will pass around it with the moisture extracted.

To illustrate this, the reservoir on the back end of the tank, with only one pipe on the reservoir (used jointly as a discharge and a return pipe), even in zero weather, contained no moisture, while the reservoir on the engine, with two pipe connections, had any amount of water, although the temperature was frequently as high as 500 deg.

The reservoir on the back of the tank, with only one pipe connection, is similar to the auxiliary reservoir on cars, and it is impossible to get water into those reservoirs, unless the B pipe is bursted, and then there is a circulation through the reservoir and will be a condensation in proportion to the amount of the leak, and the same will apply to the equalizing reservoir of the brake-valve. If it is absolutely tight, there will be no condensation, and if there is a leak, there will be.

The air in all reservoirs with but one connection is what we call "dead air," and in all of these there will be no condensation.

We discussed and investigated this matter two years ago, and discovered that the most of the condensation was at the coupling behind the tank, where there was a 45 deg. angle, and when the weather was down to about 5 deg. above zero that it froze there. At higher temperature the air would pick it up again and carry away, but at that temperature it froze as fast as it struck.

M. M. GREENWADE.

Power Brakes for Street Cars.

The report which follows explains itself. It was prepared by a committee for the Board of Public Improvements of St. Louis. Obviously, it deals with a subject of great interest and importance. We print it practically in full, omitting only the short descriptions of the four different kinds of power brakes, assuming that our readers are already quite familiar with these brakes.

Office of Sewer Commissioner, St. Louis, Mo., July 26, 1902.

To the Honorable Board of Public Improvements.

Your Committee on President's Department, to whom was referred the matter of investigating the practicability of power brakes for street railroad cars, have the honor to submit the following report:

Three members of your Committee, Messrs. Hiram Phillips, J. P. Whyte and E. A. Hermann, visited nine large cities for the purpose stated above where street car power brakes are now in use. The nine cities referred to are Pittsburgh, Washington, Philadelphia, New York, Boston, Buffalo, Chicago, Milwaukee and Indianapolis. In each one of these cities, except Washington, your Committee found street car power brakes of various designs in more or less general use; your Committee also found that the use of these power brakes has given general satisfaction both to the public and to the owners of the street railroads; that the development of several designs of street car power brakes has passed the experimental stage; that 12,000 are in every day service, and have been in such service for from two to six years; that the street railroad companies now using these brakes have put them on their cars voluntarily and were not forced to do so by compulsory legislation; that the number and especially the severity of street car accidents is materially reduced by the general adoption of these brakes; that the regularity of the intervals of time between cars is more easily maintained and the *daily mileage of each car is greater when equipped with these brakes;* that their first cost and cost of maintenance is moderate compared to the service rendered; that their first cost is repaid within three to five years by reduction of the street railway companies' expense accounts for accidents besides saving incalculable losses of life and limb; that in only two of the cities above named are the street cars as heavy, and in none of them are they run at rates of speed as high as in St. Louis, and that (proportionally to the population) in none of the cities visited are the accidents as numerous or the loss of life and limb as frequent as in this city.

Passing from these general deductions to details, your Committee found the following kinds of street car power brakes in use for periods of time of two or more years:

1st. The compressed air-brake.
2nd. The electric disk brake.
3rd. The electro-magnetic track and wheel brake.
4th. The hydraulic brake.

1st. The compressed air-brake may be divided into two types: (a) Those for which the compressed air is supplied by an air compressor pump operated by an eccentric on an axle of one pair of wheels of the car. (b) Those for which the compressed air is supplied by an air compressor pump operated by a small electric motor. . . .

2nd. The electric disk brake may also be divided into two types: (a) Those in which the power for operating the disk is taken from the trolley wire. (b) Those in which the power for operating the disk is generated by the motors of the car acting as dynamos after the current from the trolley wire has been cut off. . . .

3rd. The electro-magnetic track and wheel brake consists mainly of an electro-magnet whose poles are two track brake-shoes and whose armature is the track rail. The electro-magnet is energized by the current generated by the motors acting as dynamos after the current from the trolley wire has been cut off; the track brake-shoes are thus drawn down to the rail, forming a track brake which pulls the car down to the rail and does not lift it up, as do ordinary track brakes. The dragging force of the track brake-shoes is transferred in part to wheel brake-shoes. . . . The brake is applied by the motorman with the same controller handle with which he controls the propelling power of the car. . . .

4th. The design of the hydraulic brake is based on the pressure of a liquid upon two pistons in a brake cylinder. Oil is the liquid generally used because it does not freeze in the winter. The essential parts of this brake are the oil pump and the brake cylinder. . . . An escape valve allows some oil to pass from the brake cylinder into the oil reservoir when the non-compressible liquid is under a pressure as great as it will bear without skidding the wheels of the car, or bursting the brake cylinder or its hose connections.

Twelve thousand street car power brakes of the four kinds above briefly described are now in regular daily service in this and other countries, and their number is receiving large additions every day.

Both single and double truck street cars are equipped with power brakes of each of the kinds above named; there are, however, many more double than single truck cars so equipped. The distances required within which stops may be made with these different kinds of power brakes are not materially different; on a level track with a clean rail they will average about as follows:

Emergency stops:

Running at 35 miles per hour within	170 ft.
Running at 30 miles per hour within	120 ft.
Running at 25 miles per hour within	80 ft.
Running at 20 miles per hour within	50 ft.
Running at 15 miles per hour within	30 ft.
Running at 8 miles per hour within	8 ft.
Running at 4 miles per hour within	2 ft.

Service stops are usually made in two or three times the above distances.

Your Committee has ridden over several hundred miles of street railroad lines in the cities above named on street cars equipped with power brakes, and find that the operation of these brakes is most satisfactory. They bring the car to a quick stop of rapid gradual retardation in no way uncomfortable or unpleasant to the passenger, except in cases of emergency stops, which rarely occur, when the car may be brought to a stop with uncomfortable suddenness justifiable only to save life or limb or valuable property. The great power of these brakes is rarely abused by the motorman in making emergency stops when service stops or slow-ups are required. The motormen consider power brakes a great boon both for the relief it affords them from long continued physical exertion, and especially the relief afforded from the intense nervous strain to which they are subject in running a heavy fast-moving car not

equipped with power brakes through crowded streets. Many motormen stated that they would "quit the job" if the power brakes should be removed from the cars.

Efficient power brakes scarcely ever fail to act when needed, they never fail if properly inspected and maintained in good working order and operated by properly instructed and trained motormen, any more than the motors of an electric car fail to act under similar circumstances.

Like many other mechanisms, power brakes require brains and training for their efficient operation. The power brakes observed by your Committee apply and release almost instantaneously and cause no delay to the traffic by failure to release promptly. Street railroad officers of all ranks, of street railroad companies using power brakes, expressed their unequivocal satisfaction with the use of power brakes on their lines both from the operative and the financial standpoint. The Second Vice-President of one large company said: "We have saved at least one hundred thousand dollars for each of the last two years by the general adoption of power brakes on the cars of our lines due to the decrease of the accident expense account." How much more than the one hundred thousand dollars per year was saved he did not volunteer to say.

The President of another large company said that he considered the power brake just as essential a part of the equipment of an electric street car as the conductor's signal bell; he also stated that less power is required to operate a car equipped with power brakes than one not so equipped, because motormen will often run with the hand-brake partly set up in order to save themselves the exertion of entirely re-winding the brake when frequent stops or slow-ups must be made, thereby wasting an appreciable amount of power by lugging the brake-shoes on the wheels.

Judged by the experience gained, your Committee is of the opinion that efficient street car power brakes are essential parts of the equipment of electric street cars, that 12,000 such brakes have been in regular daily service for two or more years in many cities, that their use has long since passed the experimental stage, that their general adoption will materially reduce the number of persons killed or maimed in street car accidents, and that their use in this city should be rigorously enforced by law if the street railroad companies fail to act voluntarily in promptly equipping their cars with them.

Your Committee recommend approval of the following street car power brakes:

1. Christensen compressed air-brake, with either motor or axle driven air compressor pump.
2. Standard (Westinghouse) compressed air-brake, with either motor or axle driven air compressor pump.
3. Westinghouse electro-magnetic track and wheel brake.
4. Neal hydraulic brake.

Plans of the above named brakes accompany this report.

Your Committee further recommend that the penalties* prescribed by ordinance number 20,653 be rigorously enforced if, after 60 days from this date, the street railway companies of this city fail to begin equipping their cars with power brakes of a design or designs approved by the Board of Public Improvements, and uninterruptedly continue such equipment as fast as it may be possible to manufacture and install it, and until all the street cars of this city are so equipped.

This report is signed by Messrs. Hiram Phillips, E. A. Hermann, Jos. P. Whyte, Chas. Varrelmann.

*A fine of not less than $100 a day or more than $500 a day.

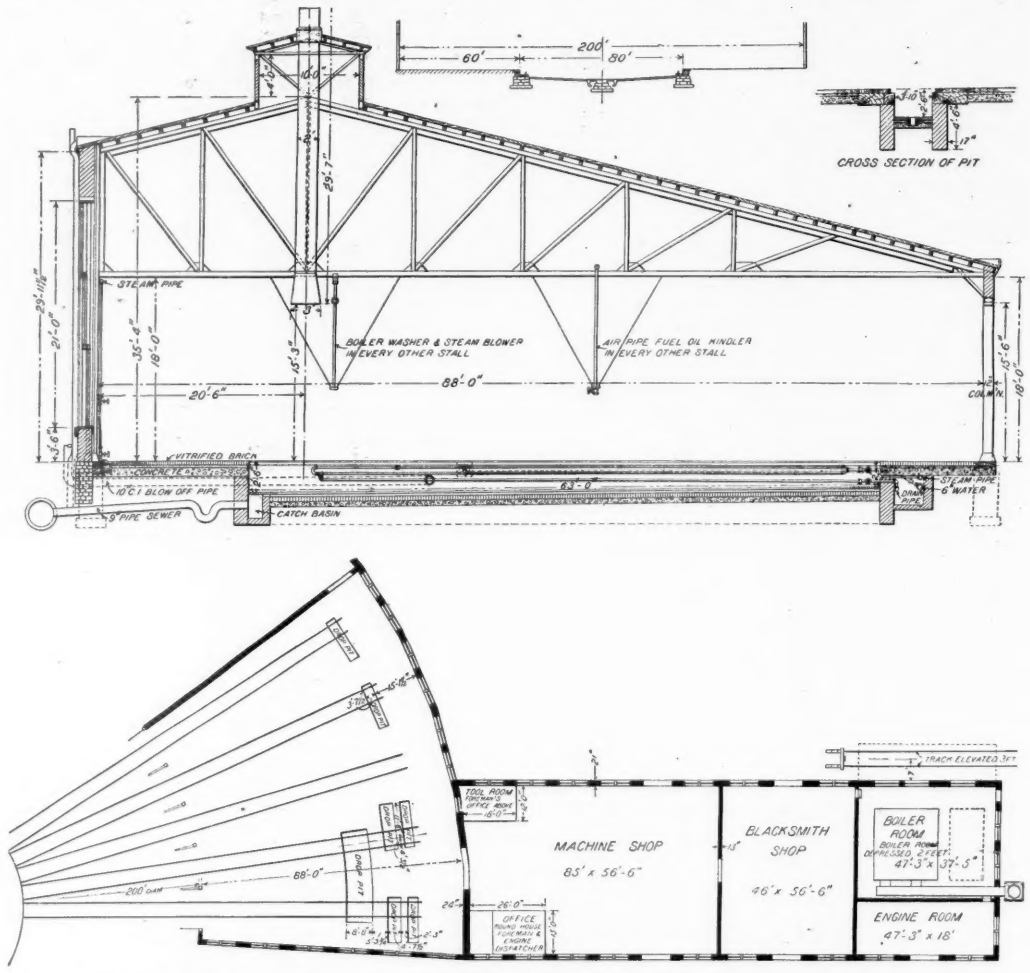
B. & O. Standard Engine-house and Machine Shop, at Fairmont, W. Va.

The engravings show a new engine-house and machine shop for the Baltimore & Ohio at Fairmont, W. Va.

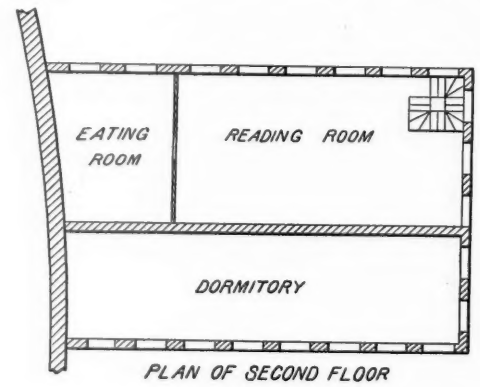
At the entrance from the turntable, the engine-house is 18 ft. high, and at the outer wall 29 ft. 11½ in., with 21 ft. windows lighting that portion of the shop where the engines are placed. The height of the shop to the peak of the roof at the base of the skylight is 35 ft. 4 in. A 4 x 10 ft. ventilator is placed on top through which the smoke jack passes. The length of the roundhouse is 88 ft. in the clear measured along the pit track. An 80-ft. turntable has been put in and will thus be able to meet future demands. There are 24 pits each 63 ft. long and 2 ft. deep at the shallow end. They drain away from the turntable into a sewer beyond the outside wall, and in this respect a departure has been made from the usual custom. The floor is made of a layer of concrete 6 in. thick, over which a 2-in. layer of sand is spread and upon this the vitrified brick floor rests.

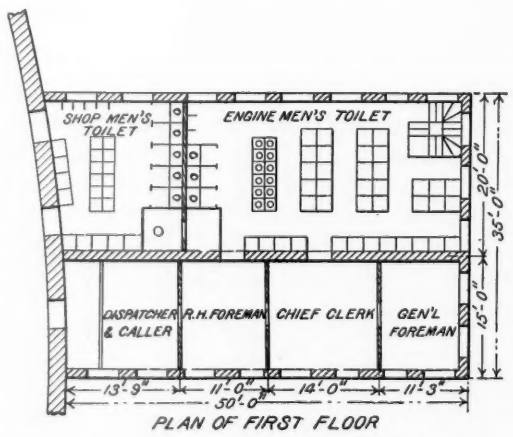
Over every other stall an air pipe hangs for supplying the oil fuel kindler. A steam pipe is also provided over every alternate pit, and may be used for washing out the boilers or for operating the blower. The doors are 60 ft. from the edge of the turntable, and the tracks run direct to it, without crossing, thus doing away with the use of frogs.

The Fairmont roundhouse has a machine shop 85 x 56½ ft. adjoining on the side next to the drop pits. The two pit tracks opposite the machine shop wall have between them a drop pit 8 ft. 8 in. wide for driving wheels, each track has two smaller drop pits for engine-truck wheels, and the two adjacent tracks have each one drop pit. The machine shop contains the office of the roundhouse foreman and engine despatcher, with tool room opposite. The general foreman has his office over the tool room. This arrangement is a departure from the standard practice of the B. & O., which is to place the foreman's office in a separate building, containing, in addition, a shopmen's toilet and locker room, an enginemen's toilet and locker room, with a reading room, eating room, and dormitory for enginemen on the second floor.



Plan and Elevation of Baltimore & Ohio Engine-house and Machine Shop at Fairmont, W. Va.





Usual Arrangement of Offices, Toilet Rooms, Etc., in Separate Building—Baltimore & Ohio.

The standard B. & O. storehouse and oil cellar shown in our illustrations is a fire-proof building. It is built of brick and has a cement and concrete floor, and a slate roof. The floor of the storekeeper's office as well as the roof of the oil cellar is supported on 6-in. I-beams with cement covered fireproof arches above. The arrangement of the oil cellar is interesting. The ground plan covers an area of about 35 by 28 ft. and contains a tank for freight car oil of 4,372 gallons capacity. A tank of the same size, beside it, contains engine oil. Three smaller tanks, on the opposite side of the cellar, each of 1,859 gallons capacity, contain cylinder oil, signal oil and passenger car oil respectively. A fourth tank holding 1,154 gallons, is filled with 150 deg. illuminating oil, and a smaller one of 705 gallons capacity contains 300-deg. illuminating oil. All these tanks can be filled very conveniently from the outside, as the roof of the cellar is only a little above the ground line, and each tank has a filling pipe extending through the roof. The oil for engines and cars is conveyed by gravity through a series of pipes, one from each tank, terminating in a row of faucets which are set over a copper pan, under the storekeeper's office. The floor upon which the man stands when drawing off oil is two feet below the level of the tank bottoms. In both the oil and general store, a counter is interposed between the storemen and those to whom the supplies are issued. This station handled 22 locomotives a day during the month of May, 1902.

Peckham's High Speed Electric Railroad Trucks.

The Peckham Manufacturing Company exhibited at the Saratoga Conventions in June, a truck built for the Chicago, Aurora & Elgin that was a striking illustration of the rapid development in electric railroad equipment during the past few years. This new type of truck is very robust, the service demanded being heavy and the speeds high. They are built with a guarantee to be satisfactory for speeds up to 75 m.p.h., and it is stated by the makers of the electric equipment for the cars, that they intend to make a running test of these cars in which it is hoped that a speed of 100 m.p.h. or more will be attained.

The axles of these trucks are 6½ in. in diameter, a size necessitated by the fact that they have not only to carry the weight of a 50 ft. car and hold up under the additional stresses due to a speed of 75 m.p.h., but they will be called upon to withstand the torque of a 125 h.p. motor, one of which will be placed on each of the four axles under the car. The journals are M. C. B. standard, 5 in. x 9 in. The frame is a flat bar, A, extending around the entire truck and forming the end and side pieces. This is trussed at the sides by the bars, B B, the upper one being bolted to the frame and the lower one to the feet of the pedestals. The transoms are set in between the main frame and the arch bars at the center and are formed of angle bulbs 10 in. deep. The transoms carry the spring plank by means of outwardly inclined hangers. This spring plank supports the bolster on a pair of coil springs placed at each end and a semi-elliptic spring in the center.

The spring suspension of the truck frame itself resembles, with some additions, the method used in passenger car construction. There is an equalizer bar on each side formed of two flat bars set on edge, upon which the equalizer springs E E are placed in the usual way, and in addition to this there are springs set on a yoke passing over the oil boxes. These latter springs serve to steady the movement of the car and check the tilting of the truck when the brakes are applied, a motion that is so objectionable with the ordinary type of truck. They come into play after the equalizer springs have been partially compressed under the load, and while they assist in the carrying of the car, the greater portion is carried by the equalizer springs and their chief function is to prevent the tilting alluded to.

The bolster was crowded down to the last limits of width on account of the space required for the motors to be used. These motors rest on the axle and drive it through gearing in the usual way with the nose held between two clips fastened to the transom. It was also desired to hold the wheel base down to 6 ft. 4 in. The bolster is, however, of considerable depth and of ample strength though narrowed for the reasons stated.

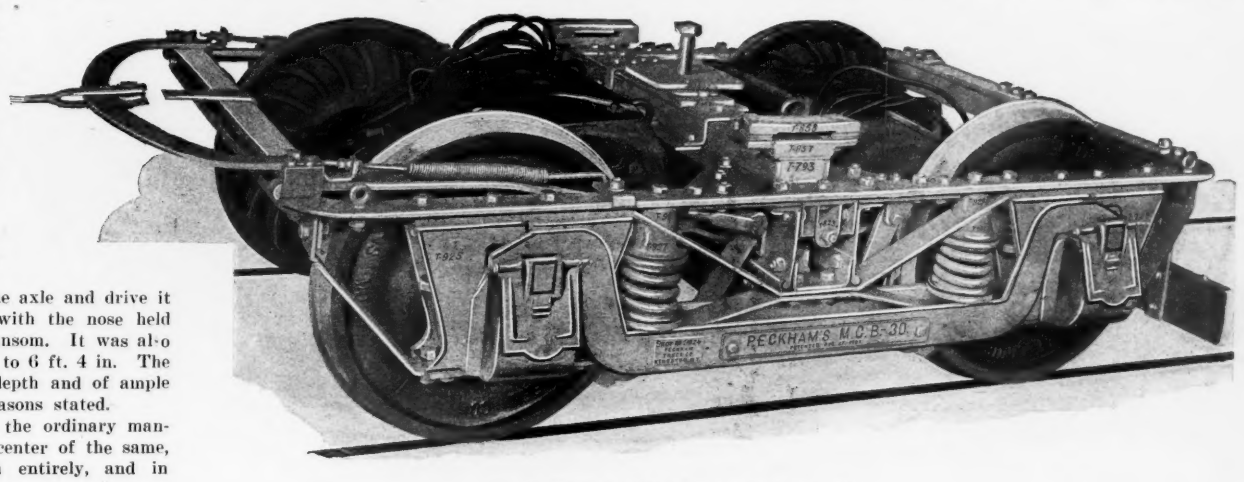
Instead of using a brake-beam in the ordinary manner and applying the power at the center of the same, the brake-beam was dispensed with entirely, and in its stead a bar of round iron that serves merely as a separator is used. This takes hold of the brake-heads and is then bent back so that it lies beneath the spring plank out of the way, and there is no obstruction to the motor between the wheels and the axle and transom. The means of applying the brakes is shown in the side elevation. There is a crosspiece to which a curved yoke is attached and over which a traveler is free to move. This traveler delivers the pull from the brake mechanism to the yoke. The pull is then carried out to each side of the truck and thence through the connection to the top of the live lever, as shown in the side elevation, and which is situated at the right. This lever is pivoted on the brake-head and the thrust to the other shoe is carried through the compression bar below the spring plank to the bottom of the dead lever. This system of levers is duplicated on each side of the truck. By this means the whole of the brake gear is carried out so as to stand in line with the wheels themselves and out of the way of all of the electrical apparatus that it may be necessary to place on the truck. The spring shown in the side elevation above one of the axle boxes is the retracting spring to throw off the brakes. It is a small coil spring acting under tension.

The wheels are of cast-steel and were specified by the railroad company placing the order. Steel castings are also used extensively throughout the truck wherever it is necessary to have the parts particularly strong. Among such castings are the pedestals.

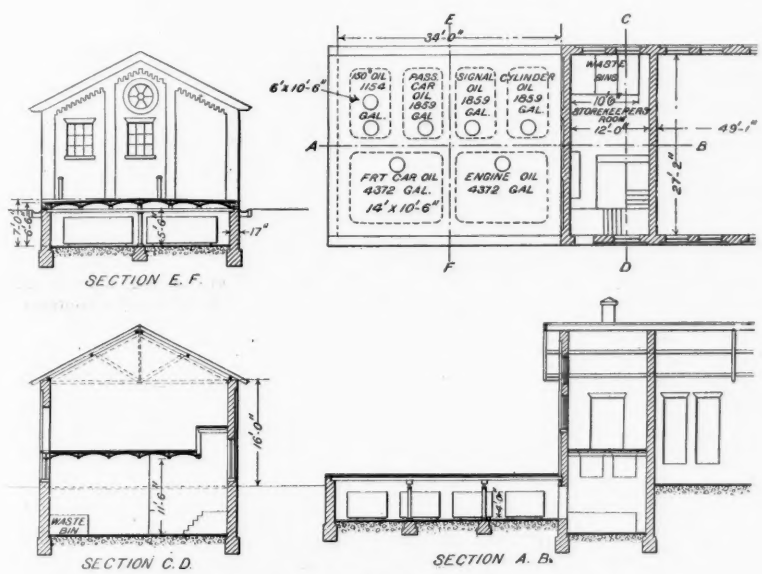
The bolster is constructed of channels 10 in. deep that set down over the coil springs at its end and serve to hold it in a vertical position. Straps secured to the transoms extend over the bolsters and prevent it from being lifted out. The king pin is 2 in. in diameter and is so secured that the car body cannot be lifted off from the truck. The center plates are large in diameter and are machined. They are fitted with a boss around the king pin for the prevention of the escape of the grease with which they are lubricated.

The arrangement of the bolster spring with the semi-elliptic in the center has been found in practice to give an exceptionally easy riding car and one that can be much more easily regulated to prevent the oscillation of cars running at high speeds than the common construction with the springs at the ends only. The distribution of the load is such that the major portion of it is carried by the end springs to prevent the oscillation while the center spring makes the use of softer springs throughout possible and thus relieves any stiffness of motion that would otherwise occur.

Arrangements are being made for the use of a truck of similar construction under the cars of steam roads; and it is expected that these will come into direct competition with the ordinary passenger car truck of standard construction.



Peckham's High Speed Truck No. 30.



Standard Storehouse and Oil Cellar of Baltimore & Ohio.

Midsummer Pig Iron Statistics.

The American Iron and Steel Association has received from the manufacturers complete statistics of the production of all kinds of pig iron in the United States in the first half of 1902; also complete statistics of the stocks of pig iron which were on hand and for sale on June 30, 1902. Every manufacturer of pig iron in the country, without a single exception, has responded to our request for information.

Total Production.—The production of pig iron in the first half of 1902 was 8,808,574 gross tons, against 7,674,613 tons in the first half of 1901, and 8,203,741 tons in the second half of 1901. It is possible that the production of the whole year 1902, notwithstanding the interruption to furnace activity caused by the anthracite strike, may exceed 18,000,000 tons. The production of pig iron by the United States in the first half of 1902 was in round figures a million tons greater than the production of either Great Britain or Germany in the whole year 1901, the total production of these countries in that year being respectively 7,761,830 and 7,736,663 gross tons.

Classified Production.—The production of Bessemer pig iron in the first half of 1902 was 5,105,932 gross tons, against 4,582,187 tons in the first half of 1901, and 5,014,606 tons in the second half of 1901.

The production of basic pig iron in the first half of 1902 was 1,053,274 gross tons, against 645,105 tons in the first half of 1901, and 803,745 tons in the second half of 1901.

Unsold Stocks.—Our statistics of unsold stocks do not include pig iron sold and not removed from the furnace bank, or pig iron manufactured by rolling-mill owners for their own use, or pig iron in the hands of consumers. The stocks which were unsold in the hands of manufacturers or their agents on June 30, 1902, amounted to 29,861 tons, against 70,647 tons on Dec. 31, 1901, and 372,560 tons on June 30, 1901. In addition to the 29,861 tons above mentioned the American Pig Iron Storage Warrant Company had in its yards on June 30, 1902, 1,000 tons of pig iron, of which 800 tons were coke and 200 tons were charcoal pig iron. The manufacturers had parted with the control of this 1,000 tons. We have never before recorded such small stocks of unsold pig iron as the figures for June 30 represent.

Furnaces in Blast.—The whole number of furnaces in blast on June 30, 1902, was 286, against 266 on Dec. 31, 1901, and 259 on June 30, 1901. The number idle on June 30, 1902, was 125.

Furnaces Building.—On June 30 there were 28 blast furnaces in course of erection in the United States, of which 24 will use coke for fuel when completed, two will use anthracite coal and coke mixed, and two will use charcoal.

The Strike.—The production of pig iron in 1901 with anthracite and mixed anthracite coal and coke was 1,712,527 tons, or less than one-ninth of the total production, and of the entire anthracite and mixed anthracite coal and coke production of the year only 43,719 tons were made with anthracite alone. The production of pig iron with anthracite and mixed anthracite and coke in the first six months of 1902 amounted to 733,740 tons, against 847,503 tons in the second half of 1901, and the production with anthracite alone amounted to 15,990 tons. These figures, reinforcing those above given for 1901, and in the face of an immense total production of pig iron in the first six months of 1902, show that this country can get along without anthracite coal in its blast furnaces, although it will fare better with it. Coke is now being wholly substituted for mixed anthracite and coke in a number of furnaces which have heretofore used the mixed fuel.—*The Bulletin.*

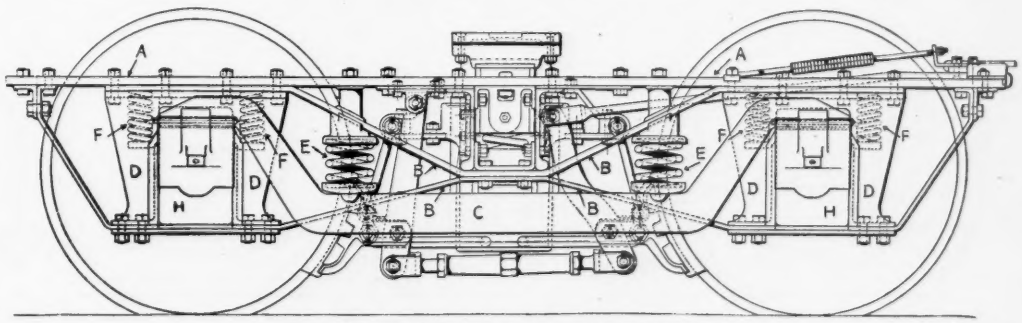
Passenger Engines for the Chesapeake & Ohio and the Missouri Pacific.

The two engines illustrated herewith are modified 10-wheelers with trailing truck added. The larger of the two was designed by Mr. W. S. Morris, then Superintendent of Motive Power of the Chesapeake & Ohio (now of the Erie), and was built at the Schenectady Works of the American Locomotive Company.

The notable features of this engine are the very long tubes, the large grate area and the liberal heating surface. The total weight of the locomotive is 187,000 lbs., with 131,000 lbs. on the drivers. The total heating surface is 3,533 sq. ft. The cylinders are 22 x 28 in. and have piston valves of an improved type. The driving wheels are 72 in. in diameter.

The smaller engine was built at the Brooks Works (American Locomotive Company), and is in general design quite similar to the machine described above. The cylinders are 20 x 26 in. and have the Brooks standard piston valves. The total weight of the engine is 173,000 lbs., with 120,000 lbs. on drivers. The heating surface is 2,953 sq. ft., and the drivers are 69 in. in diameter.

Both engines have brick-arches supported upon water



Side Elevation Peckham's High Speed Truck.

tubes. Steel castings are used wherever it was desirable to reduce the weight.

A general description of the two locomotives follows:

CHESAPEAKE & OHIO.

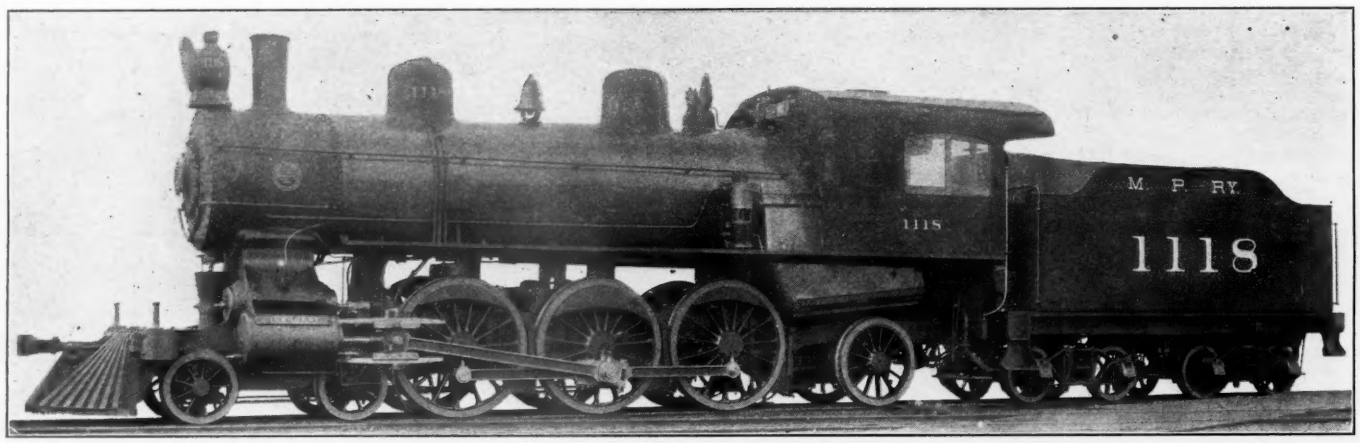
Kind of fuel to be used	Bituminous
Weight on drivers	131,000 lbs.
Weight, total	187,000 lbs.

Fire-box.

Length	78 in.
Width	80 in.
Depth, front	77 9/16 in.
Depth, back	63 in.
Material	Steel
Thickness of sheets	Side, 5/8 in.; tube, 5/8 in.
Brick arch	On water tubes

Other Parts.

Exhaust nozzle, single or double	Single
Exhaust nozzle, variable or permanent	Permanent
Exhaust nozzle, diameter	5 in., 5 1/8 in. and 5 1/4 in.
Exhaust nozzle, distance of tip below center of boiler	3 1/2 in.
Netting	Wire
Netting, size of mesh	2 1/2 x 2 1/2 in.
Stack	Taper



Missouri Pacific Locomotive.

General Dimensions.

Wheel base, total, of engine	32 ft. 8 in.
Wheel base, driving	12 ft. 8 in.
Height of stack	14 ft. 11 in.
Heating surface, fire-box	182 sq. ft.
Heating surface, tubes	3,328 sq. ft.
Heating surface, water tubes	23 sq. ft.
Heating surface, total	3,533 sq. ft.
Grate area	47 sq. ft.

Wheels and Journals.

Drivers, diameter	72 in.
Drivers, material of centers	Cast steel
Truck wheels, diameter	33 in.
Journals, driving axle, size	9 x 12 in.
Journals, truck axle, size	6 x 12 in.

Cylinders.

Cylinders, diameter	22 in.
Piston, stroke	28 in.
Piston rod, diameter	3 1/2 in.

Valves.

Kind of	Piston
Greatest travel	6 in.
Outside lap	1 in.
Inside clearance	1/8 in.
Lead in full gear	0 in.

Boiler.

Boiler, type of	Extended wagon top
Boiler, working steam pressure	200 lbs.
Boiler, material in barrel	Steel
Boiler, thickness of material in barrel	11/16 in.
Boiler, diameter of barrel	66 in.
Seams, kind of horizontal	Butt joint, sextuple riveted
Seams, kind of circumferential	Double riveted
Thickness of tube sheets	1/2 in.
Crown sheet stayed with	Radial stays

Fire-box.

Fire-box, length	90 in.
Fire-box, width	75 in.
Fire-box, thickness of sheets	3/8 in.
Fire-box, water space, width	Front, 4 and 5 in.; sides, 3 1/2 and 5 1/2 in.; back, 3 1/2 and 4 1/2 in.
Grate, kind of	Rocking

Tubes.

Tubes, number	291
Tubes, material	Charcoal iron
Tubes, outside diameter	2 1/4 in.
Tubes, length over sheets	19 ft. 6 in.

Other Parts.

Exhaust nozzle, single or double	Single
Exhaust nozzle, diameter	5 1/4 in., 5 1/2 in. and 5 3/4 in.
Stack, diameter	18 in.

Tender.

Tank capacity	6,000 gals.
Coal capacity	8 tons
Type of under-frame, wood or iron	10-in. channels
Type of truck	Schenectady standard with C. & O. box
Diameter of truck wheels	36 in.

MISSOURI PACIFIC.

Kind of fuel to be used	Bituminous
Weight on drivers	120,000 lbs.
Weight on truck wheels	31,000 lbs.
Weight on trailing wheels	22,000 lbs.
Weight, total	173,000 lbs.
Weight tender loaded	110,000 lbs.

General Dimensions.

Wheel base, total, of engine	30 ft. 5 in.
Wheel base, driving	12 ft. 4 in.
Length over all, engine	44 ft. 8 3/4 in.
Height, center of boiler above rails	9 ft. 6 in.
Height of stack above rails	15 ft. 4 1/2 in.
Heating surface, fire-box	152 sq. ft.
Heating surface, water tubes	22 sq. ft.
Heating surface, tubes	2,779 sq. ft.
Heating surface, total	2,953 sq. ft.
Grate area	42.4 sq. ft.

Wheels and Journals.

Drivers, diameter	33 in.
Drivers, material of centers	Cast steel
Truck wheels, diameter	33 in.
Trailing wheels, diameter	49 in.
Journals, driving axle	9 x 12 in.
Journals, truck axle	5 1/2 x 12 in.
Journals, trailing axle	7 x 14 in.

Cylinders.

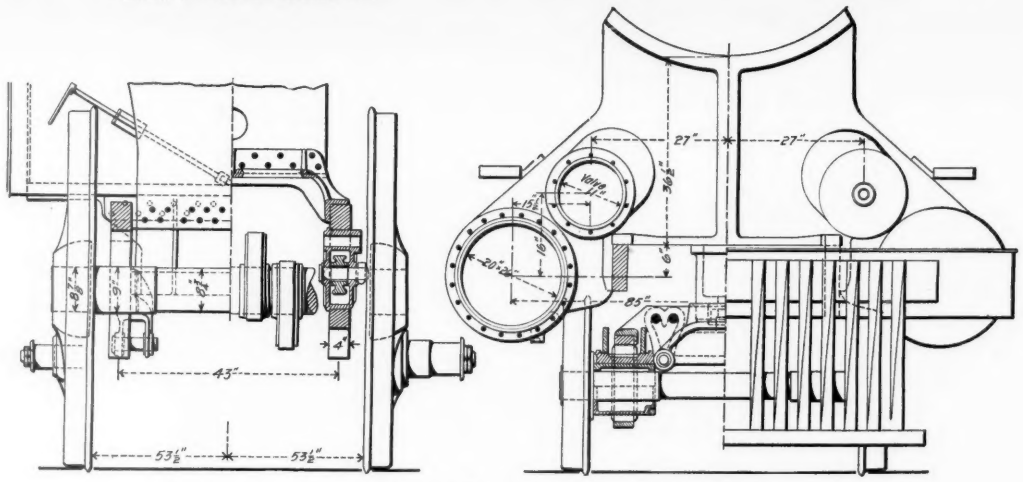
Cylinders, diameter	20 in.
Piston, stroke	26 in.
Piston rod, diameter	3 3/8 in.
Main rod, length center to center	9 ft. 3 in.
Steam ports, length	25 1/2 in.
Steam ports, width	1 7/8 in.
Exhaust ports, least area	65 sq. in.
Bridge, width	3 in.

Valves.

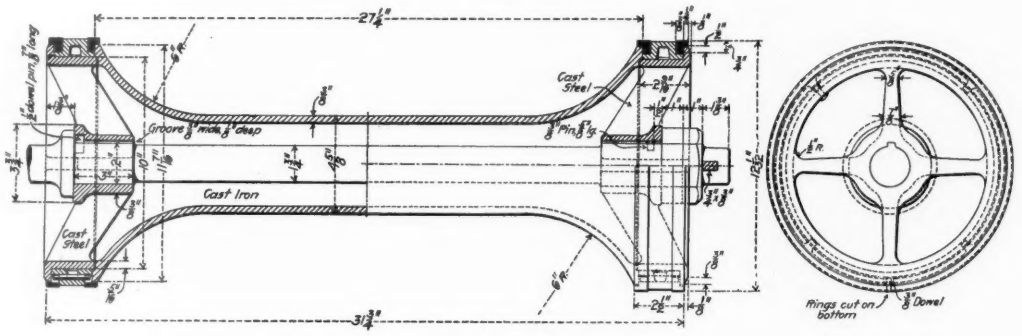
Kind of	Improved piston
Greatest travel	5 5/16 in.
Outside lap (exhaust)	0 in.
Inside lap (steam)	1 1/8 in.
Lead in full gear	0 in.
Lead constant or variable	Variable

Boiler.

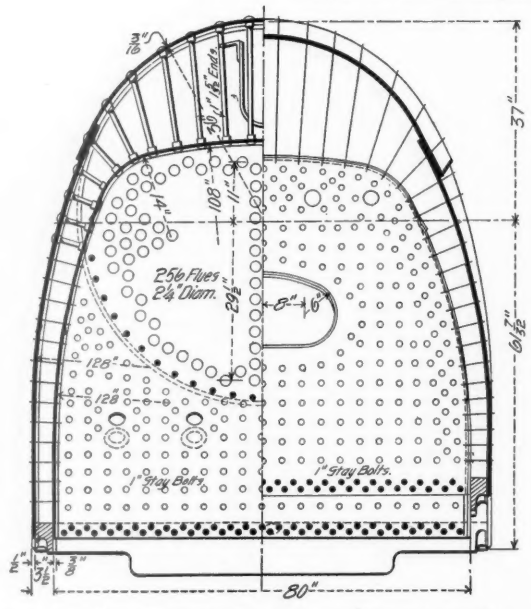
Type of	Wagon top
Working steam pressure	200 lbs.
Material in barrel	Steel
Diameter of barrel, front	64 3/16 in.
Seams, kind of horizontal	Sextuple
Seams, kind of circumferential	Triple
Thickness of tube sheets	3/4 in.
Thickness of crown sheet	3/8 in.
Crown sheet stayed with	Radial stays
Dome, diameter	30 in.



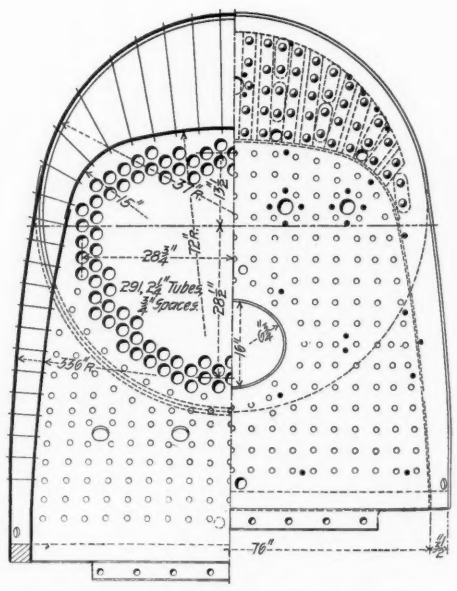
Cross Section of Missouri Pacific Locomotives.



Piston Valve of Chesapeake & Ohio Locomotive.



Cross Section Through Fire-box of Missouri Pacific Locomotives.



Cross Section Through Fire-box of C. & O. Locomotives.

Water space, width	Front, 6 in.; sides, 6 in.; back, 6 in.
Grate, kind of	Rocking

Tubes.

Number	256
Material	Charcoal iron
Outside diameter	2 1/4 in.
Length over sheets	18 ft. 6 1/2 in.

Smoke-box.

Smoke-box, diameter	67 in.
Smoke-box, length	69 in.

Stack, least diameter	15 in.
Stack, greatest diameter	17 in.
Stack, height above smoke-box	3 ft. 1 in.

Tender.

Type	8-wheel
Tank	Water bottom
Tank capacity	5,000 gals.
Coal capacity	10 tons
Kind of material in tank	Steel
Thickness of tank sheets	1/4 in.
Type of under-frame, wood or iron	Steel channel

Type of truck	All metal
Type of truck spring	Double elliptic
Diameter of truck wheels	33 in.
Diameter and length of axle journals	5 x 9 in.
Distance between centers of journals	5 ft. 1 in.
Diameter of wheel fit on axle	6⅜ in.
Diameter of center of axle	5⅝ in.
Length of tank inside	19 ft. 6 in.
Width of tank inside	9 ft. 10 in.

Train Accidents in the United States in June[1].

xe, 1st, 1 a.m., Drivers, Va., collision between a freight train of the Atlantic Coast Line and a freight of the Southern Railway, wrecking about 15 cars. One engineman was fatally injured.

dn, 1st, 11 p.m., Burlington & Missouri River, Englewood, S. D., a freight train became uncontrollable on a steep grade and ran some distance to a sharp curve, where it was derailed and wrecked. One trainman was killed.

1st, Denver & Rio Grande, Glenwood Springs, Colo., passenger train No. 6 was derailed by a rock which had fallen on the track, and the engine fell into Grand River. The mail car was partially submerged. The engineman and fireman went down with the engine, but both escaped; though the engineman was not rescued until he had floated down stream five miles to Spruce Creek. Notice was sent by telegraph to this place, and the operator succeeded in saving the engineman.

rc, 2nd, 1 a.m., Illinois Central, Rives, Tenn., a freight train ran into the rear of a preceding freight, wrecking the engine and several cars. Three trainmen were badly injured, and a man learning the road was killed.

unf, 2nd, Baltimore & Ohio, Adamsburg, Pa., a freight train was derailed by running over a horse, and several cars were wrecked. The engineman was killed and two other trainmen were injured.

dn, 2nd, 1 a.m., Chicago & North Western, Otis, Iowa, eastbound passenger train No. 6 was partly derailed at a switch in consequence of the premature throwing of the switch by a brakeman, and the rear car and sleeper were thrown violently against the engine of westbound passenger train No. 1, standing on the side track. Five passengers were injured.

bc, 3rd, Philadelphia, Wilmington & Baltimore, Elkview, Pa., butting collision between a special passenger train and an empty engine, badly damaging the engine and one passenger car. One fireman was killed and six passengers and two trainmen were injured. The collision is said to have been due to a misunderstanding of orders.

unx, 3rd, Southern Pacific, Redding, Cal., a passenger train was derailed at a switch, which is believed to have been maliciously misplaced, and the two engines drawing the train fell down a bank. One engineman and one fireman were killed.

unf, 4th, 10 p.m., Cincinnati, New Orleans & Texas Pacific, Cave Springs, Tenn., passenger train No. 5 was derailed by running over a cow and one passenger car was ditched. The engineman and fireman were killed and four passengers were injured.

o, 4th, Baltimore & Ohio, Piedmont, W. Va., the locomotive of a freight train was wrecked by the explosion of its boiler, and the fireman and one other trainman were killed. The engineman and one brakeman were injured, the latter fatally.

rc, 5th, Missouri Pacific, Nelson, Mo., a freight train ran into the rear of a preceding freight, damaging the caboose. Two passengers were killed and three trainmen were injured.

bc, 5th, Illinois Central, Galena, Ill., butting collision of freight trains, wrecking both engines and 12 cars. One fireman was fatally injured. It is said that the collision was due to a misunderstanding between a conductor and an operator.

unx, 5th, New Orleans & North Eastern, Okalona, Miss., a freight train was derailed, damaging several cars. One passenger was injured and an unknown man was killed.

rc, 6th, Chicago & Alton, Independence, Mo., a passenger train ran into the rear of a preceding freight, damaging the engine and several cars. The engineman was killed and one trainman and four tramps were injured.

bc, 6th, Southern Pacific, Benicia, Cal., butting collision between a passenger train and a work train; one fireman killed and two enginemen injured.

dr, 6th, Cleveland, Cincinnati, Chicago & St. Louis, Mix, Ohio, a freight train was derailed by a broken rail and several cars were wrecked. A brakeman was killed and two other trainmen were injured.

dn, 6th, Baltimore & Ohio, Seneca, Ohio, several cars in a freight train were crushed by the sudden application of the air-brakes, and 17 of them were wrecked.

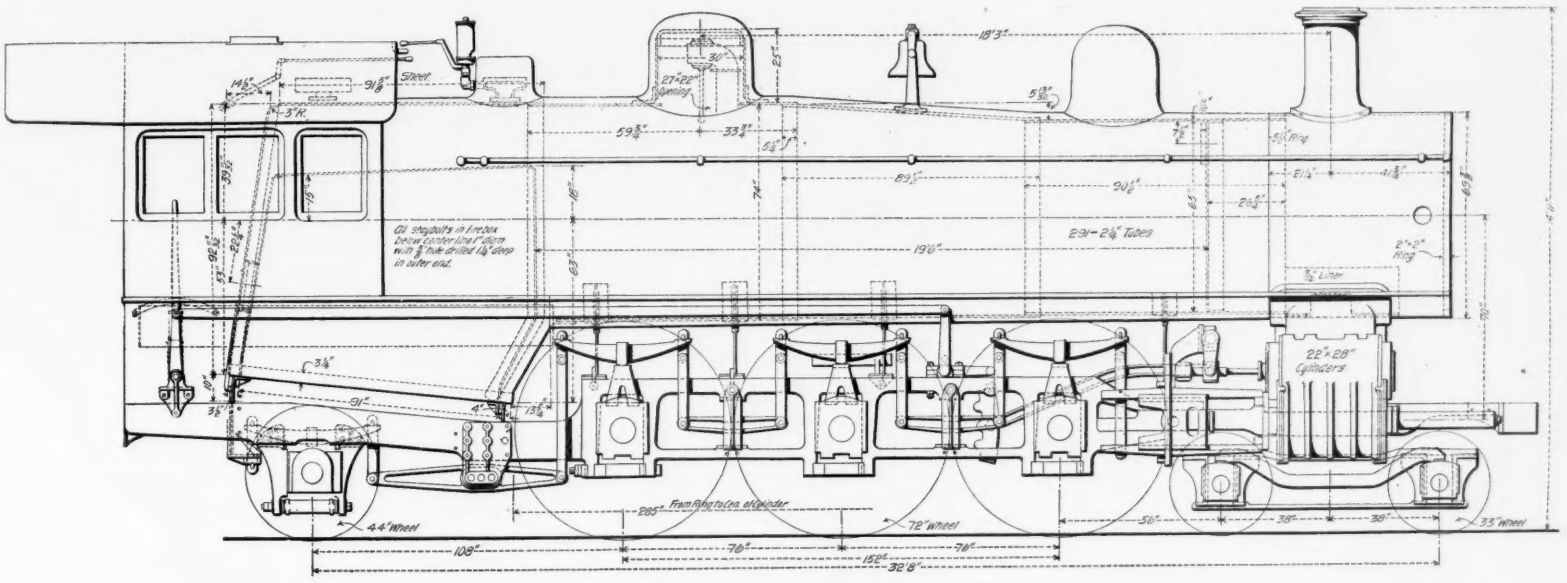
o, 6th, Richmond, Fredericksburg & Potomac, Fredericksburg, Va., the locomotive of a special passenger train was wrecked by the explosion of its boiler, and the engineman was fatally injured.

bc, 7th, Toledo & Ohio Central, Baltimore, Ohio, butting collision of freight trains; two trainmen injured.

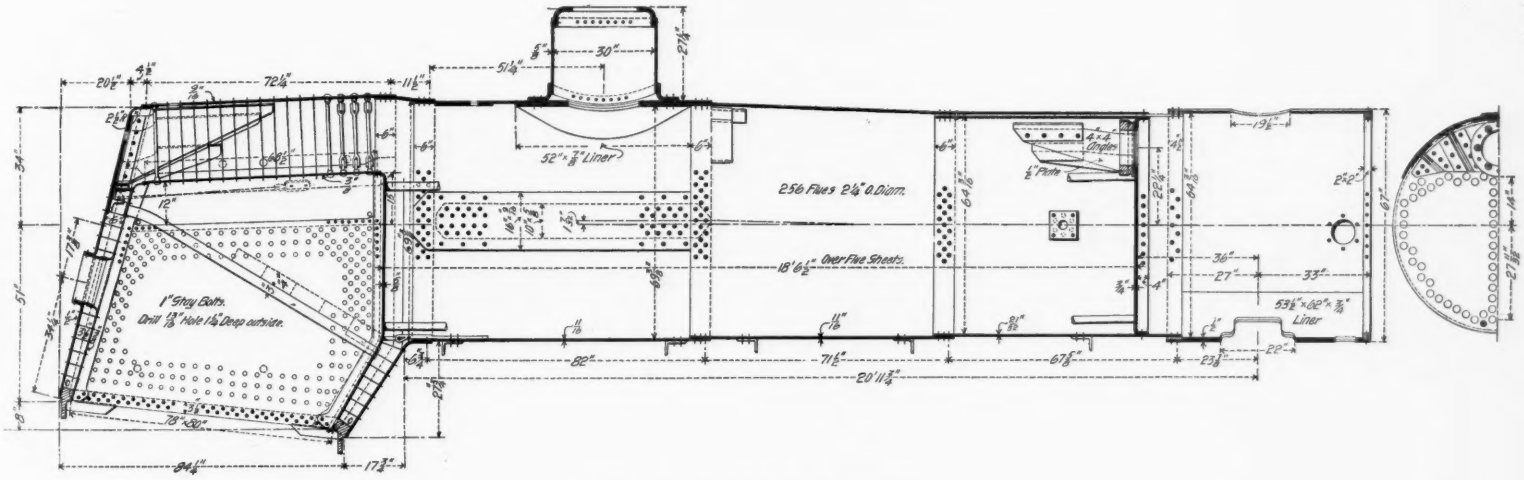
unf, 7th, Illinois Central, Ashkum, Ill., a passenger train was derailed at a misplaced switch, and the engine and baggage car were ditched. The engineman and fireman were injured. It is believed that the switch was maliciously misplaced.

unx, 7th, Cincinnati, N. O. & T. P., Tateville, Ky., a freight train was derailed and a brakeman was fatally injured.

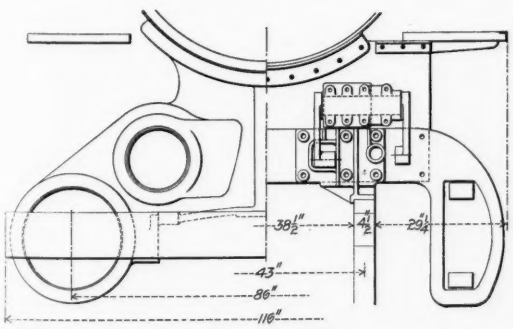
unx, 8th, Detroit & Mackinac, Black River, Mich., a passenger train carrying a large excursion was derailed, and the first three passenger cars were ditched; two of them being badly wrecked. One passenger was killed and 18 were injured. The tender was the first vehicle which jumped the track. The cause of the derailment was not discovered.



General Elevation of Chesapeake & Ohio Locomotive.



Boiler of Missouri Pacific Locomotive.



Cylinders, Saddle and Yoke of C. & O. Locomotive.

[1]Accidents in which injuries are few or slight and the money loss is apparently small, will as a rule be omitted from this list. The tabular record of totals is no longer kept, as a more complete report of the total number of accidents is published by the Interstate Commerce Commission. The classification of the accidents is indicated by the use of the following

ABBREVIATIONS.

rc	Rear collisions.
bc	Butting collisions.
xc	Miscellaneous collisions.
dr	Derailments; defect of roadway.
eq	Derailments; defect of equipment.
dn	Derailments; negligence in operating.
unf	Derailments; unforeseen obstruction.
unx	Derailments; unexplained.
o	Miscellaneous accidents.

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.

rc, 10th, 1 a.m., Wisconsin Central, Neenah, Wis., a passenger train ran into the rear of a preceding freight, wrecking six freight cars. One trainman and five passengers were injured.

bc, 10th, Southern Railway, Juliette, Ga., butting collision between a southbound passenger train and a northbound freight, wrecking both engines and several cars. The engineman and fireman of the passenger train were killed, and 19 passengers and three trainmen were injured. The collision occurred on a sharp curve, and it is said that some of the passengers were able to see the freight train just before the collision. The collision is reported to have been due to the engineman's watch being wrong.

10th, Cleveland, Cincinnati, Chicago & St. Louis, Sidney, Ohio, the locomotive of a freight train was derailed and ditched, and several cars were damaged. One brakeman was killed and two other trainmen were injured. It is said that the derailment was probably due to some imperfection in a new switch.

dr, 10th, Chicago Great Western, Dean, Mo., a passenger train of seven cars was derailed and fell down a bank, most of the cars being badly splintered. Two sleeping cars and the dining car were overturned. Only one passenger is reported injured. It is said that the derailment was due to distortion of the track by solar heat.

xc, 10th, 11 p.m., Pennsylvania Road, Sharpsburg, Pa., collision between a passenger train and some coal cars which had been accidentally run on to the main track from a siding. The engine and several freight cars were badly damaged, and four trainmen were injured.

unx, 11th, Wabash Road, Montpelier, Ohio, a work train, running backwards, was derailed. The engineman was killed and four other employees were injured.

bc, 12th, Nashville, Chattanooga & St. Louis, Hooker, Tenn., butting collision between northbound passenger train No. 98 and southbound mail train No. 1, wrecking both engines and five cars and derailing two coaches. One engineman, both firemen and two other trainmen were killed, and six other trainmen were injured. The engineman of No. 1 forgot a meeting order.

unx, 12th, Wheeling & Lake Erie, Fremont, Ohio, a freight train was derailed and 20 loaded cars fell down a bank and into the Sandusky River.

o, 12th, Lake Erie & Western, Lafayette, Ind., the engine of a passenger train was badly damaged by the breaking of a rod on one side of the engine, and the train was violently stopped. Three passengers were injured.

xc, 13th, Pennsylvania Road, Harrisburg, Pa., collision

of freight trains, badly damaging both engines. One conductor and two other trainmen were injured, the former fatally.

unx, 13th, Southern Railway, Round Knob, N. C., a freight train was derailed and the engine was overturned. The engineman was killed.

xc, 14th, Pennsylvania road, Vandergrift, Pa., a passenger train ran over a misplaced switch and collided with a work train. The passenger engineman was killed.

unf, 15th, Central Vermont, Middlesex, Vt., a freight train was derailed at a washout, due to a sudden and violent storm, and the engine and several cars were wrecked. The conductor, engineman, fireman and one brakeman were killed.

bc, 16th, Philadelphia & Reading, Schuylkill Haven, Pa., collision between a switching engine and a special train carrying policemen, badly damaging both engines. One of the firemen was fatally injured.

eq, 16th, Cleveland, Cincinnati, Chicago & St. Louis, Perth, Ind., a freight train was derailed by the breaking of an axle and eight cars were wrecked. Two men, stealing a ride, were killed, and two others were injured.

unx, 16th, 9 p.m., California & Northwestern, Sears Point, Cal., a freight train was derailed and 15 cars were ditched. A brakeman was injured.

xc, 17th, Philadelphia & Reading, East Laurel Hill, Pa., a switching engine, running backwards, ran into the rear of a freight train, making a bad wreck. The switching engine was overturned and fell down a bank. The engineman and fireman were killed.

bc, 18th, 2 a.m., Baltimore & Ohio, Evans, Pa., butting collision of freight trains, wrecking three engines and several cars. Three trainmen were injured, one of them fatally. It is said that the collision was due to one of the trains becoming uncontrollable on a descending grade.

xc, 18th, New Castle Junction, Pa., collision between a freight train of the Baltimore & Ohio and a passenger train of the Pittsburgh & Lake Erie. Two passengers were injured.

unx, 18th, Chicago & Alton, Mexico, Mo., passenger train No. 14 was derailed while running at full speed, and the engine and three cars fell into a deep ditch. The engineman was killed and 13 passengers and one trainman were injured.

19th, Texas & Pacific, Texarkana, Ark., a passenger train was derailed, presumably by an obstruction on the track, and the engine fell down a bank. The engineman and fireman were injured, the latter fatally.

†unx, 19th, South Carolina & Georgia Extension, Shelby, N. C., a mixed train was derailed at, or near, the bridge over Broad River, and four passenger cars and one freight car fell through the bridge. One passenger was killed and 14 passengers and two employees were injured.

*bc, 20th, 1 a.m., Northern Pacific, Aldrich, Minn., eastbound passenger train No. 8, ran over a misplaced switch and into the head of westbound passenger train No. 7, standing on the side track, making a bad wreck. The wreck caught fire, and four passenger cars and four baggage cars were burnt up. One conductor, both enginemen, one fireman, one baggageman and a tramp were killed, and four trainmen were injured, one of them fatally.

bc, 20th, Pennsylvania road, Cresson, Pa., butting collision of freight trains, making a bad wreck. Two trainmen were injured. It is said that the collision was due to the failure of the train despatcher to hold one of the trains at a station.

xc, 20th, 11 p.m., Boston & Maine, Wakefield, Mass., collision of freight trains, derailing 15 cars. Two trainmen were injured.

eq, 20th, New York Central & Hudson River, Cato, Pa., a freight train running at high speed on a descending grade, was derailed by the breaking of the flange of one of the wheels of a car in the middle of the train, and ten cars were wrecked. A brakeman was injured.

unx 20th, Chicago, Rock Island & Pacific, Thompson, Neb., freight train No. 79 was derailed, and 20 cars were ditched. A tramp was fatally injured.

bc, 21st, Boston & Maine, Portland, Me., butting collision between a passenger train and an empty engine, badly damaging both engines. Five trainmen were injured.

unx, 21st, Iowa Central, Murphy, Ia., the locomotive of a passenger train, running tender first, was derailed and ditched, and the passenger car next to it was also derailed. The engineman was injured.

†rc, 22d, Great Northern, Norwich, N. Dak., an empty engine ran into the rear of a preceding freight train, wrecking the caboose. A passenger riding in the caboose was killed and two other persons were injured. It is said that the engineman of the empty engine was asleep. At the Coroner's inquest this engineman said that he had been working 23 hours; he said that he had sighted the train ahead of him, and had then leaned out of the cab window, and while in this position he slept for 40 or 50 seconds.

22nd, 1 a. m., Chicago, St. Paul, Minneapolis & Omaha, Ashton, Ia., a passenger train was derailed, in consequence, it is said, of the misplacement of a swtch, and the first three cars were wrecked. Two trainmen were killed and five injured.

bc, 23rd, Cleveland & Pittsburgh, Mingo Junction, Ohio, butting collision of locomotives, badly damaging both engines. Two trainmen were killed and seven were injured. There was a dense fog at the time.

24th, Hawkinsville & Florida Southern, Worth, Ga., a passenger train was derailed and the engine and baggage car were ditched. The engineman and fireman were injured.

24th, 8 p. m., St. Louis & San Francisco, Okmulgee, Ind. T., a freight train broke through a bridge and the engine and 10 cars fell into the river. Four trainmen were injured.

xc, 25th, Cincinnatti, New Orleans & Texas Pacific, Emory Gap, Tenn., a passenger train ran over a misplaced switch and into a freight train, standing on a side track, badly damaging both engines. One engineman was injured.

bc, 26th, Mobile & Bay Shore, Mobile, Ala., butting collision between a freight train and an empty engine. Three trainmen were injured.

eq, 26th, Norfolk & Western, Salem, W. Va., an eastbound freight train was derailed by the breaking of the flange of a wheel and 25 cars were damaged. A part of the wreck fell on to the westbound track, and 10 cars of a train on that track were derailed. A tramp was killed.

bc, 27th, Baltimore & Ohio, Confluence, Pa., butting collision of freight trains wrecking three engines and 12 cars. One brakeman was killed. It is said that an operator neglected to deliver an order to one of the trains.

27th, Southern Pacific, East Bernard, Tex., freight train No. 24 was blown off the track by a cyclone and the engine and 21 cars were ditched. Five trainmen were injured.

*rc, 29th, Baltimore & Ohio, Orleans Crossroads, W. Va., a freight train ran into the rear of a preceding freight, wrecking the caboose and several cars. Three cars loaded with lime took fire and were burnt up. A telegraph operator riding on the caboose was fatally burned.

bc, 29th, Pennsylvania road, Clearfield, Pa., butting collision of freight trains, wrecking both engines and 10 cars. A brakeman was killed and one other trainman was injured.

†29th, Colorado Midland, Cascade, Colo., an excursion train was derailed and three passenger cars, occupied by nearly 400 passengers, were overturned and badly damaged. One passenger was killed and 30 were injured. It is said that the derailment was due to a broken rail.

eq, 29th, Denver & Rio Grande, Glade, Colo., a freight train was derailed by a broken wheel, and 12 loaded cars were ditched. A tramp was killed.

unf, 29th, Leavenworth, Kansas & Western, Dana, Kan., a worktrain was derailed at a washout, and the 21 men on the train were all injured; but none of them very seriously.

bc, 30th, New York Central & Hudson River, Bell's Landing, Pa., butting collision of freight trains, making a bad wreck. One brakeman was killed. An operator neglected to deliver an order to one of the trains.

unf, 30th, 3 a.m., Choctaw, Oklahoma & Gulf, Round Pond, Ark., a freight train was derailed by running over a cow, and the engine was overturned. The fireman was killed and the engineman and one brakeman were injured.

unf, 30th, Texas & Pacific, Boyce, La., a westbound passenger train was derailed by running over a horse, and the engine was ditched. The engineman and fireman were killed.

An Upsetting and Forging Machine.

The 4 in. upsetting and forging machine, herewith illustrated, is built by the Acme Machinery Co., of Cleveland, Ohio, and is, according to their statements, the most powerful of its kind ever built.

The mechanism for closing the dies is shown in detail by Fig. 1. The cam C rotates with the shaft R between the pins P P. These pins are rigidly connected to the casting A which moves back and forth with each revolution of the shaft. The links L L when in their normal position are slightly cambered, the result being that there is always a vertical component of the horizontal thrush tending to throw them upward. The proportions are such that a horizontal pressure of 65 tons produces a downward pull of 10,000 lbs. upon the spring S. Any further increase of pressure compresses the spring and allows the links to move upward as shown by dotted lines, and thus relieve the machine from destructive strains. The springs bring the toggle links to their normal position on the backward stroke. This closing device gives a large amount of what is known as "time," that is, the time the dies remain closed with reference to the advance of the upsetting plunger. This is an important feature.

The grip slide, toggle head and moving die block are steel castings, as is also the 18½ ton bed. The toggle links are heavy hardened tool steel forgings and are four in number, thus insuring an even closing of the die blocks whatever may be their initial position. The factor of safety employed throughout is 15. A general view of the machine is shown in Fig. 2.

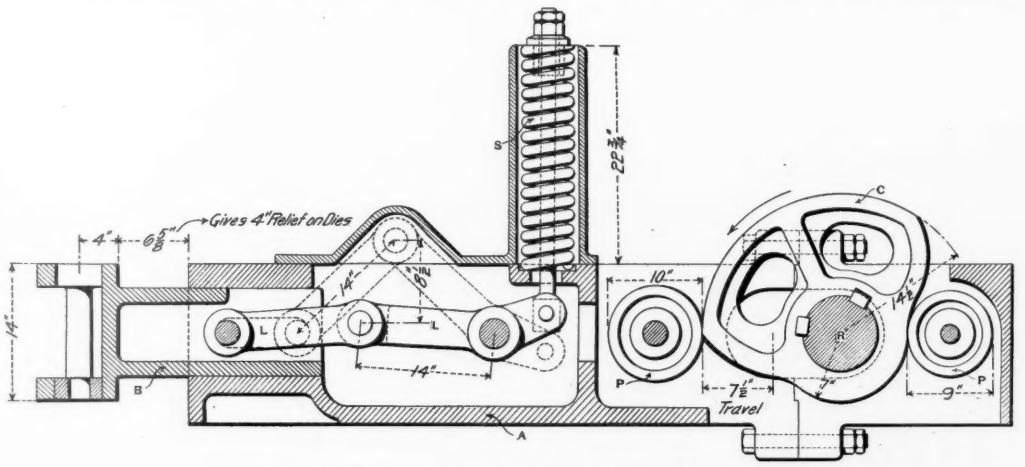


Fig. 1.—Toggle Slide of Four-Inch Heading Machine.

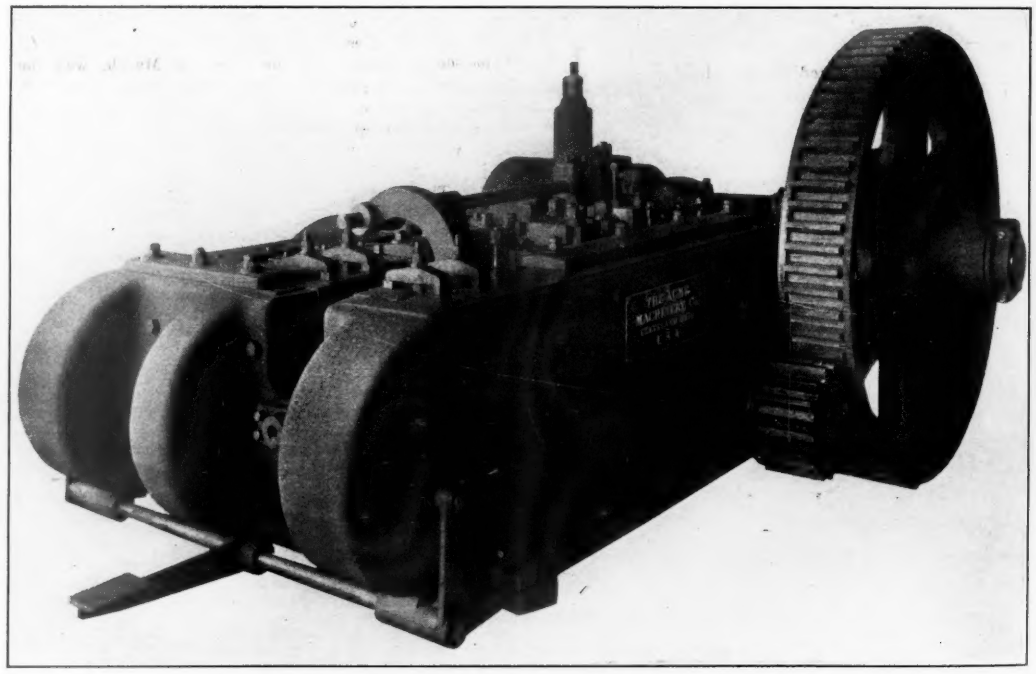


Fig. 2.—Four-Inch Upsetting and Heading Machine.

Regulations for Illinois Central Operators.

The Illinois Central has issued a code of rules to govern the telegraphers on its lines. We quote portions which seem to be new:

Rule 1.—Any employee required to perform the duties of a telegrapher at any telegraph station where the movement of trains is effected by telegraph train orders will be considered a telegrapher, also telegraph operators employed as such.

Rule 3.—Telegraphers will not be disciplined or discharged without just cause, and will be given a hearing within 10 days before the Board of Inquiry; and the Superintendent shall be present at such investigation whenever practicable. All grievances which may exist must be taken up with the Superintendent in writing within 30 days after the occurrence.

In the event that any grievance cannot be satisfactorily adjusted with the Superintendent, such telegrapher shall have the right to appeal, if employed on lines south of the Ohio River, to the Assistant General Superintendent, from him to the General Superintendent of Transportation, and from him to the Assistant General Manager; if employed on lines north of the Ohio River, to the General Superintendent of Transportation, from him to the Assistant General Manager, and from him to the Second Vice-President in either case. Employees reporting directly to the Superintendent of Telegraph will have the right of appeal to the Assistant General Manager, and from him to the Second Vice-President.

Rule 4.—At offices on the main lines where one or two telegraphers are employed, 12 hours shall constitute a day's work; where three or more telegraphers are employed 10 hours shall constitute a day's work. But split tricks will be continued where the business of the company requires it.

Telegraphers who are also agents shall be required to meet regular trains, except between the hours of 9 p.m. and 5 a.m., without extra compensation, but if required to meet trains between those hours overtime not exceeding a total of one hour per day will be allowed; if held after or before the time necessary to meet regular trains by order of the despatchers, overtime will be allowed at regular rates.

At offices on 24 branch lines (which are named) where

one man is employed as joint agent and operator or telegraph operator, the hours of duty will be regulated by the Superintendent.

Rule 5.—At all offices, except on the branch lines specified in Rule 4, where telegraphers are called up at night, or are held on duty in addition to their regular prescribed hours of work, except as provided in Rule 4, an allowance covering the time on duty will be made on the basis of a prorate of their regular rate of pay, but in no case will less than 20 cents per hour be paid.

Telegraphers performing service at wrecks and washouts will be allowed regular salary and overtime earned as per this rule, with a minimum of 20 cents. In case telegraphers are called at night after being relieved, they shall be paid a minimum of one hour, 20 cents.

Rule 6.—Telegraphers may be excused from such Sunday or holiday duty at such times and places as circumstances may permit, at the discretion of the Superintendent and without reduction of pay.

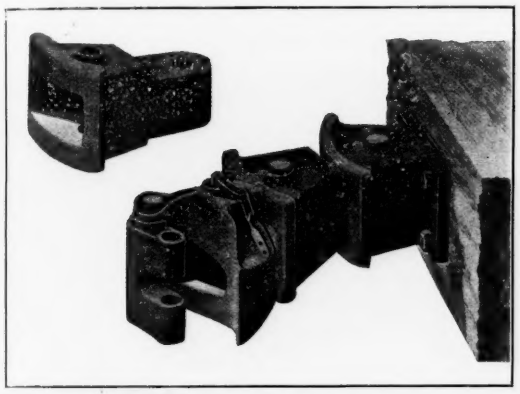
Rule 7.—No reduction from the present rates of pay will be made, except when changed conditions make it necessary; and if telegraphers consider such reductions unwarrantable they will be given a hearing before the proper officials in the regular way.

Rule 10.—Telegraphers transferred by order of the company will be furnished free transportation for themselves, their families and household goods; and will suffer no loss of pay.

Rule 11.—At stations where section men reside, or where porters or helpers are employed, telegraphers will not be required to attend switch-lights, but they will see that they are kept burning.

An Intermediate Coupler.

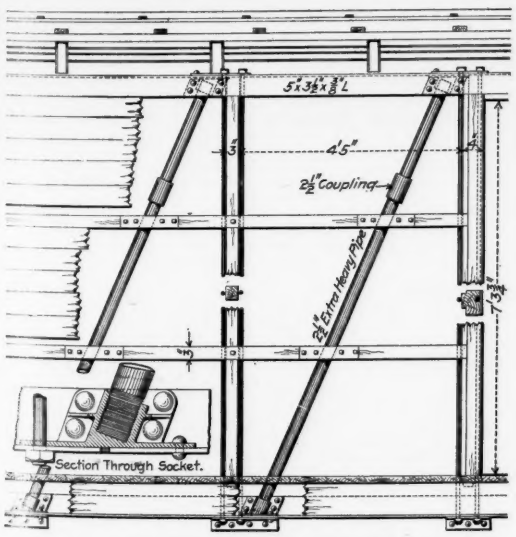
Mr. W. C. Wilson, Master Mechanic of the Terminal Railroad Association of St. Louis, calls our attention to an intermediate coupler, designed for use in coupling on sharp curves. With this auxiliary, cars may be coupled on curves without the use of links, and without loss of time. The device is patented by Mr. Wilson, and is in use on yard engines of the Terminal Railroad Association, and the employees ask that all engines of the Association be similarly equipped. This is a permanent part of the coupler, and no time need be taken for changes in working on curves. This simple apparatus is so well shown in the engraving that further description is not necessary.



An Intermediate Coupler.

A New Steel Car Frame.

Patents have recently been issued to H. C. Hodges, President of the Detroit Lubricator Co., for a combination wood and steel framing for freight cars. Details of the construction of the framing are shown in the accompanying engraving. The members are arranged as a "*bastard Howe*" truss, steel tubes being used for compression members and rods for tension members. The side sill of the car is a deep plate riveted at its top edge to an angle running the length of the car just below the floor line. A supplementary timber is placed inside the angle as a support for the floor boards. The side plate on which the carlines rest is made of angle iron and is continuous the length of the car. Screw sockets, shown in detail, are riveted to the angles which form respectively the side plate at the top of the frame and the top member of the side sill, into which are screwed the 2½ in. steel tubes forming the diagonal struts. For convenience in removing, these are made in two pieces joined by a right and left coupling. The side girths are cut away to form a clamp for the tubes, the loose piece being held to the girth by four bolts. The vertical members are oak posts flanked on each side by a steel rod fastened through the top and bottom angles. The end frames are similar in form to the usual box car end framing and combine the same features as the side frames. It is claimed that this construction may be applied to high side gondolas, passenger and baggage cars, and a lighter and cheaper construction obtained than those now in use.



Side Framing and Screw Socket.

We are not informed that any order has been placed to build a car on this design.

Government Accident Bulletin Number 3.

The Interstate Commerce Commission has issued its Accident Bulletin (No. 3), summarizing the collisions, derailments and casualties to passengers and employees on the railroads of the country during the three months ending March 31 last.

The number of persons killed in train accidents was 212, and of injured, 2,111. Accidents of other kinds, including those sustained by employees while on duty, and by passengers in getting on or off cars, etc., bring the total number of casualties up to 10,223 (665 killed and 9,558 injured). These accidents are classified in the following table.

Table No. 1.—Casualties to Persons.

	Passengers.		Employees.	
	Killed.	Injured.	Killed.	Injured.
In collisions	26	501	104	765
In derailments	15	298	53	351
Miscellaneous train accidents, including locomotive boiler explosions	0	27	14	171
Total train accidents	41	826	171	1,285
Coupling or uncoupling cars	0	0	35	550
While doing other work about trains or while attending switches	0	0	25	856
Coming in contact with overhead bridges or structures at side of track	1	2	21	264
Falling from cars or engines, or while getting on or off	8	254	124	1,818
Other causes	3	177	236	3,526
Total (other than train accidents)	12	433	441	7,014
Total, all classes	53	1,259	612	8,299

The number of passengers reported killed in collisions and derailments is not so great as in either of the last two quarters, but it is still large, two accidents having caused the death of 29 passengers (and the injury of 182). One of these, in January, was a rear collision of passenger trains, and the other, in March, was the derailment of a passenger train running at full speed, followed by a fire. The collision was due to the carelessness or incompetency of the engineman of the rear train, who disregarded two fixed signals which showed warnings designed to protect the preceding standing train. This engineman had filled one position or another in train service for about 12 years, but he had been engineman on this line (where the collision occurred) for a period of only five months, and had been in charge of a passenger train on this line for only a very few trips. The line is one on which trains follow one another (in the morning and in the evening) at very short intervals—two or three minutes—yet it appears, from the report of the State Railroad Commissioners, who investigated the accident, that this engineman was inexperienced, lacked reasonable presence of mind when he failed to see the signals, and unmistakably violated a well-known rule. The State Railroad Commissioners also characterized the engineman as of "unascertained capacity," and they declare, therefore, that the railroad company was grossly negligent.

The report of the derailment says that the cause is unknown. The accident occurred in the night, and it is conjectured that there may have been an obstruction on the track. As in the last preceding quarter, there were a number of passengers killed in rear collisions of freight trains, the passengers being in the cabooses. Seven passengers were thus killed.

The collisions and derailments are classified as below:

Table No. 2.

	Number.	Loss.
Collisions due to train separating	194	$80,149
Collisions due to other causes	1,026	924,875
Total collisions	1,220	1,005,024
Derailments due to defects of roadway, etc.	143	101,384
Derailments due to defects of equipment	369	266,032
Derailments due to negligence of trainmen, signalmen, etc.	55	34,078
Derailments due to accidental causes	55	223,203
Derailments due to malicious obstruction of tracks, etc.	10	6,935
Derailments due to other causes	206	277,602
Total	838	909,234
Total collisions and derailments	2,058	1,914,258

The average loss by each collision was approximately $824, and by each derailment $1,085.

In Bulletin No. 2, containing statistics of a number of particularly disastrous butting collisions, a tabular statement was given showing the magnitude and causes of the most important accidents of the quarter coming within that class. In the quarter now under review, rear collisions are the most prominent, and a table is therefore given of 41 of the most serious cases in that class; that is, of all involving over $2,000 damage each. The list also includes one other, in which four passengers were killed, and one due to a "failure in block working." In all, there were, it will be seen, three collisions due to this last-named cause, and a fourth due to failure of an automatic block signal.

Causes of Forty-one Rear Collisions.

G.	Record No.	Train.	Killed.	Injured.	Damage.	Cause.
1.	36	Fght....	4	11	$1,400	Train approached water tank at uncontrollable speed.
2.	8	Fght....	1	3	1,571	Block signal set at clear when block section was not clear.
3.	24	P. & Fght ..		2	2,000	Special passenger overtook freight; weather thick, flagman "could not be seen."
4.	25	P. & Fght	1	3	2,000	Misplaced switch.
5.	38	Fght.... ..		..	2,000	Improper flagging.
6.	11	Fght.... ..		..	2,072	Flagman failed to go back far enough.
7.	27	Fght.... ..		..	2,033	"Engineman exercised poor judgment."
8.	28	Fght.... ..		..	2,100	Flagman failed to use torpedo.
9.	5	P. & Fght ..		2	2,200	Improper flagging.
10.	14	Fght.... ..		..	2,200	Fast running and improper flagging.
11.	42	Fght.... ..		..	2,200	Approached yard at uncontrollable speed.
12.	29	Fght....	1	..	2,393	Neglected to flag.
13.	16	Fght.... ..		..	2,400	Flagman failed to go out while his train was switching.
14.	39	Fght.... ..		..	2,600	Engineman failed to keep a good lookout.
15.	34	Fght....	1	1	2,800	Engineman (and brakeman) asleep on engine. Fireman did not watch for signal.
16.	35	Fght.... ..		2	2,900	Runaway on steep grade.
17.	20	Pass.... ..		7	2,400	Failed to flag.
18.	22	Pass.... ..		3	2,400	Misplaced switch (at station); switch obscured by steam.
19.	21	Pass.... ..		17	2,465	Failed to flag.
20.	9	Fght.... ..		4	2,500	Failed to flag.
21.	30	Fght....	3	1	2,900	Fast freight overtook local freight at station in a blizzard.
22.	43	Fght.... ..		..	3,000	Failed to flag.
23.	31	Fght.... ..		1	3,100	Flagging neglected, and train approached station too fast.
24.	37	Fght....	1	1	3,235	Failed to flag.
25.	41	Fght.... ..		..	3,300	Too high speed; failure to flag.
26.	2	Pass.... ..		6	3,500	Neglected 5-minute time interval and also approached station too fast.
27.	17	Fght....	1	1	3,500	Improper flagging.
28.	32	Fght.... ..		..	3,500	Train approached station too fast; engineman had been on duty 18¾ hours.
29.	26	Fght....	1	4	3,678	Failure of automatic block signal.
30.	4	1st class (not P.) & Fght.	4	5	3,800	Block signal set at "clear" when block section was not clear.
31.	13	Fght....	1	2	4,000	Block signal set at "clear" when block section was not clear.
32.	7	Fght.... ..		..	4,300	Too high speed.
33.	10	Fght.... ..		..	4,600	Engineman "claims" did not see flagman.
34.	33	Fght....	3	7	5,000	Runaway on steep grade of 37 cars, only 8 air-braked. Crew had been on duty 25 hours; 3 brakemen had had less than 3 months' experience.
35.	40	P. & Fght ..		1	5,000	Too high speed; failure to flag; conductor and engineman at fault; each had 1 year's experience; flagman 3 months.
36.	23	P. & Fght	2	5	5,500	Freight overtook passenger train which by reason of leaky boiler was losing time and was not protected by flag.
37.	15	Fght. and wk. tr'n.	2	3	6,000	Conductor of work train overlooked regular train on time-table.
38.	1	Pass....	17	150	9,800	Engineman ran past block signal indicating "stop."
39.	19	Fght.... ..		1	10,900	Conductor neglected to display tail lights and flagman neglected to go back with stop signal.
40.	18	Pass.... ..		12	13,000	Flagman (at night) failed to go back far enough; thought an approaching train was a yard engine.
41.	43a	Fght.... ..		..	14,000	Too high speed on descending grade; train of 40 cars, all had air-brakes, but only 12 of them were connected up; 3 brakemen had 15 mos.', 10 mos.' and 2 months' experience, respectively.
Total, 41 collisions			43	225	$160,247	

As in the list given in the last bulletin, the causes are stated very briefly, yet the statements in most cases give substantially all that is contained in the railroad company's report. The observations made in that bulletin in regard to the incompleteness and insufficiency of the explanations of causes given by the railroad companies will apply with equal force to the present case, though it is true that where the time-interval system is the regulation depended on for the prevention of rear collisions, and where delays to trains consequently necessitate "flagging," the diagnosis of a collision is often much simpler than in the case of butting collisions. "The flagman failed to go back far enough," or "the following engineman failed to properly control the speed of his train," or both of these, figure as principal causes in a great many cases.

It will be obvious that some of the explanations do

not bear much relation to the rules which were violated. For example, the fact that a snowstorm was raging does not explain a collision, for the regulations prescribe measures for insuring the safety of trains under such circumstances. It is regrettable to observe that in two of the most costly collisions in this list, one of them causing the death of three trainmen, the failure to use a sufficient number of air-brakes appears to have been a principal cause of the disaster. Excessive hours of work also figures in one of these; and again in another and less costly case.

Neither this list nor that of butting collisions, before published, contains anything exceptional. The causes of these costly cases are of the same general character as those of the hundreds of less costly ones. The $160,247 charged against these 41 cases is equal to about 42 per cent. of the total cost ($380,948) charged against all of the 385 rear collisions of the quarter; but as far as the question of causes or remedies is concerned, the minor cases are little if any different from the others. And of course the publishing of these tables in this way does not mean that this kind of collisions is prominent in one quarter of the year and that kind in another, except that exceptional fatality attended one or a few cases, as stated, in these particular periods. In number of cases, gross money loss (not including damages for personal injuries), and variety of causes, all the bulletins are pretty much alike, and the list of butting collisions in the last bulletin could, in its essential features, be pretty nearly duplicated in this and in the next, except in the number of casualties to passengers. Reports mentioning men who have been on duty very long hours, or whose experience in train work is less—sometimes much less—than one year, and stating that only a few air-brakes were used (where more would have prevented the accident) are as frequent among the great number of cases not cited as in the lists published. In the quarter now reported the seven most costly butting collisions are charged with damage to cars, engines, and roadway, amounting to $125,758, or nearly $18,000 each.

The bulletin contains tables, like those in former bulletins, classifying coupling accidents and those due to falling from cars.*

*The *Railroad Gazette* records of train accidents for three months ending March 31 will be found on pages 164, 231 and 347. The most prominent accidents in our reports are the following:

	G.	R.
January; Railroad Gazette, March 7, p. 164.		
3d. New Florence, Pa.	30	4
8th. New York City	38	1
12th. Chicago	40	18
February; Railroad Gazette, March 28, p. 231.		
3d. Apple River, Wis.	1	36
14th. Allegrippus, Pa.	34	33
16th. Litchfield, Ill.	36	23
24th. Aurelius, N. Y.	..	..
March; Railroad Gazette, May 9, p. 347		
7th. Maxon, Tex.	..	..

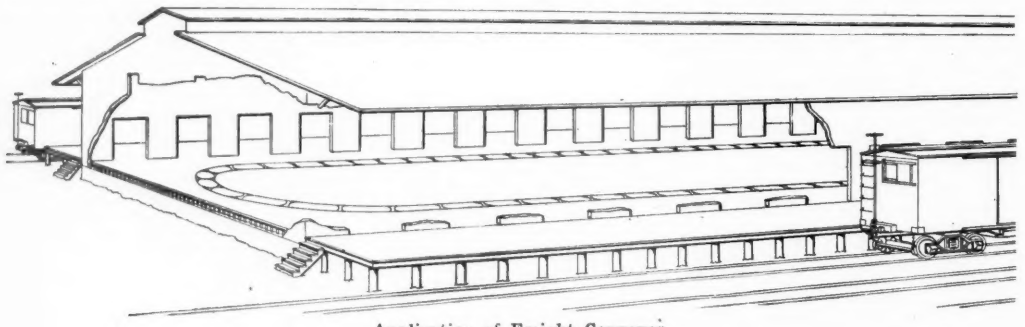
All of these accidents, except the last in the list (Maxon), were collisions. All but Aurelius were rear collisions; and, by comparing the number of casualties, the causes, etc., we may identify these with certain items in the table of rear collisions given in the Bulletin. To facilitate reference we have added to the bulletin table, in the column headed "G," a series of numbers by which the several collisions can be more quickly referred to. The Maxon derailment appears to be the one referred to in the bulletin immediately after Table No. 1.

A Mechanical Freight Transfer.

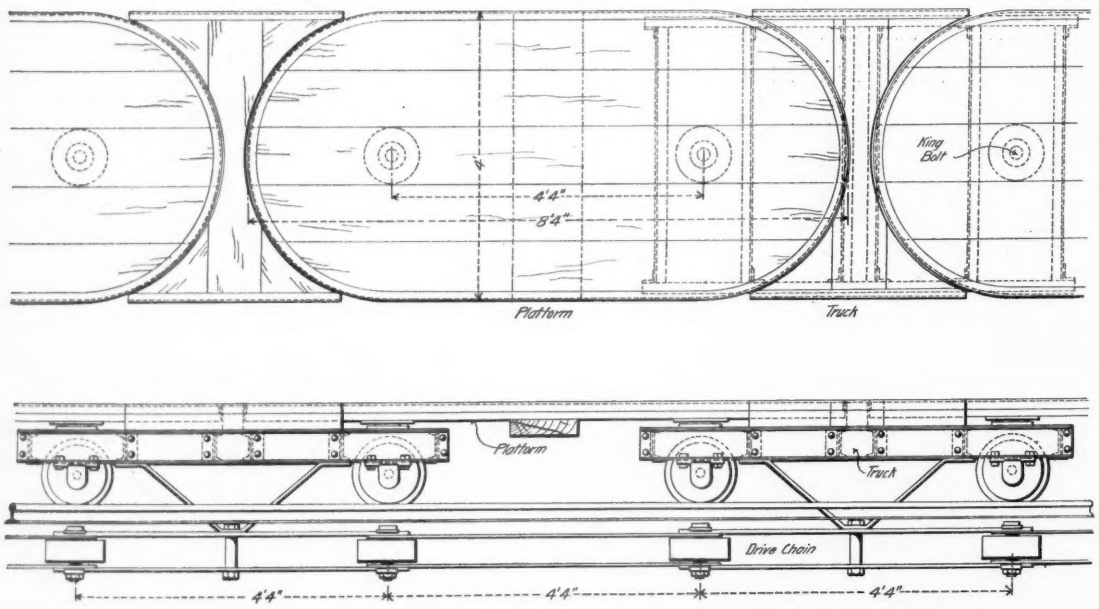
The recent freight handlers' strike in Chicago makes of more than usual interest at this time a device which, if installed in freight houses, is intended to do away with truckers almost entirely. The nature of the device is apparent from the illustrations, and particularly from Fig. 1, which shows its installation in a modern freight house. As will be seen, it consists of an endless series of platforms, so placed as to travel within a convenient distance of the doors on either side of the house, the rate of travel being about 60 ft. a minute, though this may be regulated to suit governing conditions.

The platforms are made of 3-in. oak and are 8 ft. 4 in. long by 4 ft. wide, with the ends rounded off on a 2-ft. radius. The edges are bound with angle iron and the platforms are stiffened and braced with steel. These platforms are carried by steel trucks having frames made of channels and running on 16-in. cast-iron wheels, the distance between wheel centers being 4 ft. 4 in. The trucks run on 20-lb. T rails spiked to 8 x 10-in. timber stringers, the upper surface of the platforms being flush with the freight house floor.

Beneath the trucks, attached to the under side of each and midway between the rails is the drive chain. This chain is made up of 10-in. cast-iron rollers having a pitch of 4 ft. 4 in. and connected by flat wrought-iron strips held together by 2-in. bolts, which latter also form the roller spindles. The motive power is electricity, motion being imparted to the chain by a second shorter chain, carried on suitably-placed sprocket wheels driven by gearing, and having teeth or lugs which come in contact with the rollers of the transfer drive-chain. In passing around curves a guide rail is placed so that these rollers will come in contact with it and prevent the platforms from crowding against the floor, and binding.



Application of Freight Conveyor.



Details of Truck for Freight Conveyor.

The freight can be loaded on warehouse trucks by the loaders and run on to the platform direct from the cars. Or it may first be sorted and then placed on the platform, each lot or truck load being given some distinguishing mark indicating where it should be taken off. Thus it will be seen that the trucking of goods across the floor may be done away with entirely. When it is necessary to cross with a truck the platform, being flush with the floor and not traveling very rapidly, presents no inconvenience.

To get the best results, or in other words, to reduce trucking to a minimum, the freight house should be as long as possible in order that all of the cars may be accommodated on two or three tracks. As the freight must be handled into and out of the cars by trucks, the closer to the transfer these cars stand the less trucking will be required in loading and unloading, and the greater the proportion done by the transfer.

The device is designed and built by the Link-Belt Machinery Co., Chicago.

The management of the Sicilian railroads has been experimenting with petroleum as fuel for locomotives and is preparing to adopt it for a large part of its engines. Russian petroleum can be obtained by pipe line from the Caspian to the Black Sea and thence by a very direct route by sea.

Printing Titles on Tracings.

The practice of printing titles on tracings instead of doing the work by hand or using a rubber stamp is being adopted by many of the larger railroads and manufacturing concerns of the country. Such a practice has decided advantages over the other methods mentioned. The printed titles are uniform in appearance and much neater than the majority of those done by hand, as well as very much cheaper. The time required by the average draftsman to affix a presentable title to a drawing makes such titles comparatively expensive. The printing may be done by the office boy, and it is estimated that the average cost of printed titles is but 15 cents each. Outfits especially designed for work of this character are made by Golding & Co., Chicago, and although they have been perfected only in the last eight months some 21 or more prominent railroads, bridge building and other manufacturing concerns are employing them in their drafting rooms.

Previous attempts at printing on tracing cloth failed because no satisfactory ink could be found that would dry quickly and give a clear print. Ordinary printer's ink was too slow in drying, though otherwise satisfactory. The ink now used with the Golding outfits is made by the Keloe Ink Co., Chicago, and will dry perfectly in a few hours. The drying may be greatly expedited by sprinkling tracing-cloth powder on the freshly printed title, which will permit a blue print to be made at once.

Design of a Concrete-Steel Arch Culvert.

BY DANIEL B. LUTEN.

A concrete arch is a structure that grows continually stronger with age, both because of the continual increase in strength of concrete, and because of the compacting of the earth filling on the arch and back of the abutments. A steel bridge on the contrary grows continually weaker, on account of corrosion and, possibly, crystallization. Bridge engineers have found by experience that proportioning a steel bridge for the then existing traffic, without sufficient regard for increase of traffic, must in these days of rapid development result in their early reconstruction. In an attempt to profit by this experience, and also because of the difficulties and ambiguities attending the design of concrete arches, engineers now show a tendency towards the other extreme, and the latter type of structure is being erected with excessively heavy sections. Many of these arches are designed according to Trautwine's formulæ for arches of second class masonry, and then more material added, frequently on the crown where it will do the least good.

It cannot, of course, be said that concrete is a reliable material in the same sense as steel, but experience is daily showing that concrete possesses qualities of uniformity, tensile strength, resilience and adaptability that make it superior to first-class stone masonry, for most railroad structures. A careful examination of stone and concrete arches and other structures on our western railroads, shows that section for section, the stone masonry will show more cracks, seams and flaws than the concrete. When concrete is reinforced with steel, it becomes a remarkably reliable material, as is evidenced by the development of its use in fireproof floor construction; concrete-steel girders are now used to span openings of 10 to 20 ft. that formerly required steel I-beams of practically the same depth and much greater cost. Stone, concrete, and concrete-steel may indeed in many of their qualities be likened to cast-iron, wrought-iron and steel.

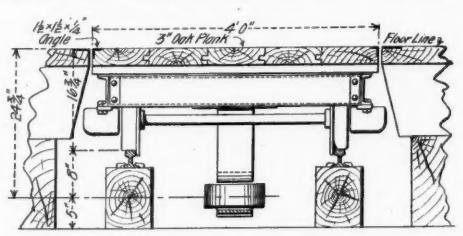


Fig. 1.—Concrete Steel Arch—Earl Park.

It must be admitted, however, that stone under present methods of treatment of these materials, will under average conditions present the better appearance.

Concrete-steel is a material that may be treated with a considerable degree of refinement in the design of an arch structure; the form of curve of the intrados, and the section of the rib may be computed with a precision

that almost compares favorably with steel itself. If the earth filling upon an arch exert only vertical pressures on the rib, the curve of equilibrium is a transformed catenary, which differs from a segment of a circle by having a considerably sharper curvature at the haunches, especially

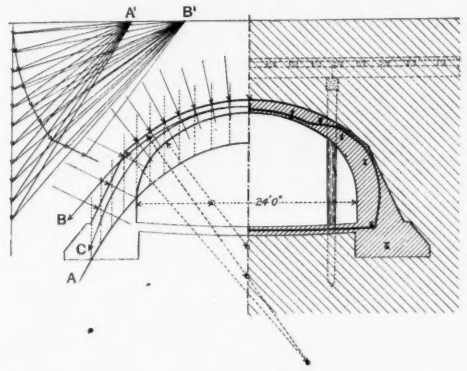


Fig. 2.—Detail of Design of Concrete-Steel Arch.

for flat arches. The earth pressure is not vertical, however, but possesses horizontal components, the effect of which is to still further increase the curvature of the curve of equilibrium at the haunches of the arch. To use the segment of a circle for such structures is to add undue weight at the very point where the arch is most weakened by failure to follow the equilibrium curve. It was the disregard of such principles, that, in the introduction of steel bridges, resulted in the Victoria tubular bridge at Montreal, which has recently been replaced by a more modern structure.

In the design of a concrete-steel bridge, there is opportunity for a great deal of discrimination in the method of arranging the steel. If the arch rib be made so heavy that there are no bending moments, then there is no necessity for any steel reinforcement whatever. A rib or rail with most of the metal concentrated near the central axis of the arch rib is not efficient in resisting bending moments. A familiar example of steel inefficiently placed in concrete-steel structures is to be found in the so-called rail-top box-culverts in use on many roads; old steel rails are placed side by side at intervals of say six inches, spanning the opening, and then covered and embedded in concrete, the rails usually being covered to a depth of 1 in. below, and 12 or 18 in. above, with concrete or mortar. Now if these rails are to support the load by their transverse strength, then it is unwise to increase the load upon them by the addition of any more concrete than is just sufficient to serve as a protective coating; if, however, the rails are to act as tension members of a compound beam, as they certainly do, then an old steel rail is a very poor form of section in which to use the steel. The fact that it is more economical to sell the old rails at the current market price, and use reliable new metal instead, has resulted in the beam-top form of box culvert, in which I-beams are substituted for the rails, frequently with the upper flange near or above the central plane of the cover. This device is open to the same objections as the other; the upper flange of the beam can resist neither tension nor compression when thus placed, and is, in fact, useless except as filling material. A more efficient section for the steel would be a tee-beam with the flange down, and embedded as closely as practicable to the lower surface; and still better, when engineers will have learned to trust it, would be the use of steel bars or rods as tension members, embedded near the lower surface, as in fireproof floors in buildings. With the same amount of metal, the latter arrangement would result in a cover that would be both stronger and stiffer.

In resisting compression, steel is not as economical as concrete if the increased dead weight of the member be neglected; in resisting tensile stresses, steel is much more economical than concrete. Thus the allowable compressive stress per sq. in. of steel is from 30 to 40 times as great as that of concrete, but the cost per unit of volume is about 60 times the cost of concrete. On the other hand the allowable tensile stress of steel is about 150 times as great as that of concrete. An efficient combination of concrete and steel would therefore require that the steel should be so placed as to be in tension only, and the concrete in compression only, as far as possible.

A concrete-steel arch in which an attempt was made to conform to the foregoing principles, was erected under the writer's supervision at Earl Park, on the Cleveland, Cincinnati, Chicago & St. Louis in June, 1901, by The National Bridge Company, of La Fayette, Ind. The arch is shown in photograph in Fig. 1.

In general terms, the method of design was as follows: The earth loading assumed as bearing vertically upon the arch rib has for its curve of equilibrium the transformed catenary. This was determined for the given span, rise and depth of loading passing through the center of the rib at the crown, and the curve of the extrados drawn approximately parallel to it; the earth loading was then assumed to be pressing normally against this curve of the extrados, and a new curve of equilibrium tangent to the catenary at the crown, determined for this arrangement of the loading; the intrados of the arch was then drawn approximately parallel to this latter curve of equilibrium. If the earth pressures could be relied upon to remain always vertical, then an arch rib of the form of the transformed catenary as above determined would be sufficient; or if the earth pressures could be relied upon to remain always normal, then the rib of uniform thickness of the form of the curve of equilibrium for normal forces, would be sufficient. It would seem reasonable to suppose, therefore, that a rib designed to include both the former ribs, would provide an adequate section for any and all conditions of the earth loading. This method of analysis is not in conformity with the theory of the elastic arch, but it produces a safe design, and one much more economical of material than empirical rules such as Trautwine's.

The steel reinforcement in the arch rib is in the form of rods 1 in. in diameter, placed so as to resist the tension caused in the rib by concentrated loads at or near the crown; the rods arranged in a single series and 2 ft. apart follow the intrados closely near the crown, then cross the rib at the point of minimum bending moments, and follow the extrados closely over the haunches and into the abutments. Similar rods extending from abutment to abutment, and embedded in a pavement of concrete beneath the bed of the stream, join the former rods in the abutments by means of open hooks with upset ends, and resist the horizontal thrust of the arch ring against the abutments. This pavement of concrete has the additional advantages of rendering the bridge flood-proof, of acting as a strut to support the wings and to keep the abutments from being forced inward by extreme earth pressures, of providing a substantial support for the forms during erection, and of preventing the soft material of the earth foundations from yielding under the pressures of the abutments. There is indeed abundant argument for such a pavement, and of solid concrete, without considering its value as a protective coating for the tie rods.

The design of the arch is shown in detail in Fig. 2. A

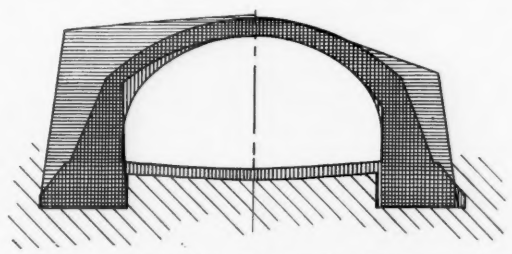


Fig. 3.—Relative Cost of Concrete-Steel and Stone Arches. Vertical Shading for Concrete-Steel; Horizontal Shading for Stone.

is the catenary determined by trial, from which the transformed catenary B is derived by vertical projection. The catenary is constructed by means of the force polygon A^1, in which the horizontal thrust is made equal to the least ordinate of the catenary, and divisions of the load line equal the divisions of the arc of the curve. The curve of the extrados is drawn parallel to the transformed catenary, the thickness at the crown being made sufficient to resist the horizontal thrust; the horizontal thrust of the transformed catenary, that is of the dead load, is to that of the catenary, inversely as their least ordinates, thus locating B^1 of the force polygon for the former curve. On the assumption that the earth pressures are normal to the extrados, the force polygon B^1 with load line parallel to the successive normal loads, and horizontal thrust the same as that of the transformed catenary, determines the curve of equilibrium C for normal pressures. The curve of the intrados is drawn as nearly as practicable parallel to this latter curve.

The back of the abutment was built to a plane surface, which allows the upper curve of equilibrium to pass without the arch rib. The possible moment that might be thus introduced as well as the moments due to live load, which were determined roughly by the theory of the elastic arch, or by assuming the arch hinged at the crown, are resisted by the steel rods placed as shown in Fig. 2. The size of the rods is computed on the assumption that the stress in the concrete varies as the distance from the neutral axis, which assumption while

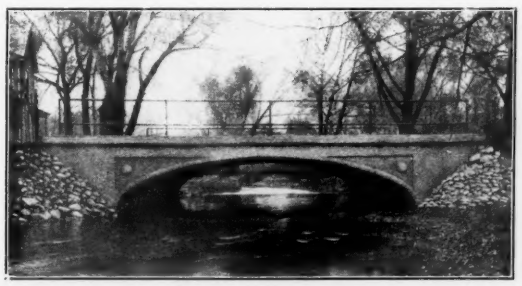


Fig. 4.—Concrete-Steel Bridge at Pontiac, Mich.

not accurate, has been proved to be on the safe side and to give excessive sections.

In constructing the arch, the foundations of natural cement concrete were first placed, then the pavement of Portland cement concrete, after which the forms were erected upon the pavement, and the arch completed, not in radial sections, but in ring sections, a complete ring being finished in one day's work. The arch ring and wing walls were also of Portland cement concrete, all of which was mixed in the proportions of one cement, two and one-half sand, and five crushed limestone under 2 in. This arch was built to replace a timber trestle, of which two of the bents, spaced 18 ft. on centers, were included in the 24 ft. span of the arch. These bents were boxed in to prevent vibration, free from the forms, and the arch then built up around the boxes; so that when the arch was completed, three timbers of each bent passed through openings each 1 ft. sq. in the haunches of the arch ring. Steel rails were placed at frequent intervals longitudinally of the arch, as shown in Fig. 2, to bond the sections together, and to bond the wings to the arch; one line of rails with ends overlapping 8 ft., was placed in the base of the abutments to prevent settlement at the middle of the arch; a second line was placed just inside the junction of the upper and lower rods to distribute the pull in the horizontal ties; a third line was placed in the haunches to receive the thrust of the arch ring; all three of these lines were prolonged into the wing walls. An additional line of rails was placed on each side of each bent to strengthen the sections through which the piles passed.

The removal of these pile bents permitted of a rather severe test upon the arch; the earth filling had been placed only to the extent shown in the photograph, that is, with the abutments barely covered, when the girders of the timber trestle were blocked up on the arch ring, being supported at the crown and haunches only, the bents then sawed out, and the holes plugged with concrete. The forms were then removed. The photograph of Fig. 1 shows the arch at that time, the bents and forms removed, and the arch supporting the three spans of the trestle, the girders resting upon blocking directly upon the bare concrete of the arch rib. For three weeks traffic was permitted to cross the structure at full speed before the filling was continued, the structure showing no flaws in consequence.

Three lines of steel straps were imbedded near the crown transversely to the rods, passing under each rod, and weaving up into the concrete to prevent the concrete from being ruptured in the plane of the rods, by the tendency of the rods to straighten under tension.

In Fig. 3 a comparison of this structure is made with certain forms of stone arches. A cross section of the concrete-steel arch is drawn to scale as constructed, except that the section has been increased by an amount of concrete equal in cost to that of the embedded steel, so that the section represents the amount of concrete that would be equal in cost to the concrete and steel combined. This section is shaded by vertical lines. Superimposed upon the left of this section is the cross-section of a stone arch of first-class stone masonry now being erected in the East by an important railroad; the section is shaded horizontally. The stone arch is of more than twice the span of the concrete arch, and has been reduced in scale in the drawing for comparison, but this fact only adds force to the comparison, since the larger the arch the lighter comparatively may be the section. The section shown with horizontal shading on the right of Fig. 3, is that of a first-class stone masonry arch proportioned according to Trautwine's empirical formulas for thickness at crown and springing. Of the sections on the left of the figure, the stone arch contains 90 per cent. more material than the concrete-steel arch, and of the sections on the right, the stone arch contains 30 per cent. more than the concrete steel structure, neglecting in each case the pavement which would in most railroad culverts be common to all.

A concrete-steel highway bridge of 30 ft. span and 60 ft. roadway was erected at Pontiac, Mich., according to this same method of construction, a photograph of which is shown in Fig. 4. The contract price was $2.280.

The New York Rapid Transit Extension.

On Thursday of last week the Rapid Transit Commissioners awarded to the Rapid Transit Subway Construction Co. the contract for extending the subway and tunnel into Brooklyn, as briefly described by us in an editorial article last week. This is the outcome which everybody expected. The contract, which has been awarded does not include the line under Broadway from Union Square to Forty-second street, which, it seems to us, is a mistake. The decision of the Commission appears to have turned on a technical point and it is very possible that the contract may yet be modified to include this Broadway line.

Switching Charges on Georgia Roads.

The Railroad Commission of Georgia has issued an order limiting switching charges, practically everywhere, to $2 a car. The fact that the service may in some cases cost $3 or $5 appears to have had no weight. The order says:

"A charge of no more than $2 per car without regard to weight or contents, will be allowed for transporting, switching or transferring a loaded car from any point on any railroad to any connecting railroad or to any warehouse, sidetrack or other customary point of delivery which may be designated by the consignor within a distance of three miles from the point of starting.

"When in the transfer of a car between said points, it is necessary to pass over the lines of intermediate road or roads, the maximum charge of $2 shall be equitably divided between the roads at interest.

"When a charge is made for the transfer, switching or transportation of loaded cars between said points no additional charge shall be made for the return of the empty cars."

Heretofore this rate has been prescribed only for cars on which one or both roads had received other revenue; but now it applies in cases where the shipment both originates and terminates in the same city.

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

Car Building in the United States.

Last month the Census Bureau published a Bulletin (No. 214 of the 12th Census) devoted to that division of manufactures which includes steam railroad cars. This is for the census year 1900, being the year to June 30. Our own figures, printed in our last issue of that year, are for the calendar year, and therefore they are only approximately comparable.

In the census year 1900 the total cars built in the United States were 145,440, of which 118,504 were built by the contracting companies and the rest by the railroad companies. Our own figures were for the contracting companies only, as it was quite impracticable to get statistics from all of the railroad companies. Our figures give 124,106 cars as having been built by the contracting companies in the calendar year. These were 115,631 freight cars, 1,636 passenger cars and 6,839 street railroad cars. The census figures make the freight cars built by the contracting companies 116,590, the passenger cars 979 and the street cars 935. It must be that some street cars escaped the census men, for our returns were official. The freight cars built by the railroad companies in their own shops (according to the bulletin) amounted to 26,543, and the passenger cars to 390.

The total freight cars built by the railroad companies and the contracting companies in the census year of 1900 (see above) amounted to 143,133. In the following calendar year (1901) we ascertained that 136,950 freight cars were built by the contracting companies, and if we make a guess that the railroad companies built 26,050, the total freight cars built that year numbered 163,000. This, of course, is only an approximation, for while our figures for the contracting companies are very close, we can do nothing but guess as to the railroad companies.

The difficulty of collecting statistics of this sort from the railroad companies is indicated by the great number of railroad shops. The census tables give railroad car and repair shops (leaving out contracting builders) as numbering 1,296. One not only hesitates to undertake to get exact figures from so large a number of shops, but the considerate editor must always refrain from troubling the railroad companies with questions; at best he has to ask a good many. Therefore, we have never tried to collect just this class of figures from the railroads.

This bulletin gives some rather interesting statistics of a general kind. For example, the total establishments reported are 1,361, and they are rated as having an aggregate capital of $207,904,000. In this total the contracting companies stand for 65 establishments and a capital of $88,324,000. The total wage earners employed number 207,000. Of these 33,000 are in the contracting shops and 174,000 in the railroad companies shops. The total value of the product is estimated at $308,748,000, being for the contracting companies $90,510,000 and for the railroad companies $218,238,000. Or, the railroad companies report the value of product at $1,254 per wage earner employed, while the contracting companies report the value at $2,742 per wage earner. Of course, all of this is of very little significance, for the work in railroad shops is largely repairs and not highly productive. Even capital involved in these shops must often be estimated by the railroad companies in a pretty arbitrary way.

As giving some notion of the relative amount of the repair work in the railroad companies' shops, we cite the figures of repairs as given in the bulletin, namely, 8,376,769 cars and 1,375,265 locomotives repaired in the shops of the companies. The statistician says "the number of repairs shown for cars and locomotives may include several repairs of the same car or locomotives. It must not be inferred that the number of single cars and locomotives reached so large a total." We should think not, for, according to the latest statistics of the Interstate Commerce Commission, there are in the United States only 1,450,838 cars and 37,663 locomotives.

A table which shows the growth of this part of the industries of the United States is striking. For instance, the number of establishments reported in 1900 was 1,361; in 1890 this number was 787, and in 1860 it was 62. The wage earners employed numbered 207,000 in 1900, 138,000 in 1890 and 3,179 in 1860. The value of the product was $4,303,000 in 1860, about $200,000,000 in 1890, and nearly $309,000,000 in 1900.

Another interesting fact is brought out in the comparison of the shops of the contracting companies, omitting now the railroad companies. These numbered 65 in 1900 and 71 in 1890, a decrease of 11 shops in that decade. The wage earners numbered 33,453 in 1900, and 31,354 in 1890: The value of the product increased from 70 millions to 90½ millions. Of course, everybody knows that these figures are affected by the consolidations which took place during the ten years, under which the number of establishments decreased 15½ per cent., the number of wage earners increased only 6 1/3 per cent., while the value of the product increased 29 per cent.

A curve is given showing the value of exports of passenger and freight cars from 1890 to 1900. This curve shows a high peak in 1883, when the exports amounted to about $1,900,000. The lowest point was in 1885, a little short of $400,000. Again a maximum appears in 1891, namely, about $2,900,000; a low point appears in 1895, about $890,000, while in 1900 the value of the exports had risen to $2,558,000.

This bulletin does not report locomotives built by contracting shops, but it does give the number of locomotives built in 1900 by the railroad companies, namely, 272. In that calendar year we reported 3,153 locomotives as built by the contracting companies.

Runaway Trolley Cars.

Reports of collisions like that which occurred near Gloversville, N. Y., on the night of the 5th of July are especially exasperating in that they indicate that electric railroads all over the country are blindly disregarding those simple lessons connected with the running of cars on steep grades which were learned by the steam railroads many years ago and which are on record for all who will read. We do not wish to magnify this particular accident—it is already painfully magnified by the bare record of thirteen persons killed—for not all of the particulars have been clearly explained, and in some particulars the conduct of the company may be less reprehensible than in the cases of other collisions on other roads. Neither do we wish to imply that all electric-car accidents are caused by ignorant motormen or short-sighted officers. But prominent cases which *do* manifest features of similarity are so common that, as we have said, there is irresistible evidence of inefficient management in many places. The public feels this. In spite of its proverbial blindness to danger and its disposition to trust to luck, it realizes that there is a marked lack in electric railroad management; and its unformulated complaint is so real and so widespread that it ought to be intelligently defined.

This grave defect in street-car service is not to be minimized, or the issue clouded, by any comparison with the collision records of steam railroads. Steam railroads do have runaway accidents on steep grades, in spite of their 75 years of experience. Inefficient men and poorly designed or poorly maintained brakes are still to be found in standard railroad service. But passengers' lives are not sacrificed as at Stratford, Tacoma and Allentown,* and on all the best roads the passenger trains are safeguarded by simple rules and provisions which are universally agreed to be wise and effective, and are also universally observed to be lacking on electric lines. To convey a score or a hundred passengers down a seven per cent. incline—or a two per cent., or one per cent., for that matter—is a grave and delicate responsibility; how is it that its gravity and delicacy are so often ignored?

This collision occurred at eleven o'clock at night on Saturday, July 5. A car returning to Gloversville from Mountain Lake, a summer resort about four miles from the town, and a thousand feet above it, became uncontrollable on the steep grade and ran into the rear of a preceding car; and both cars were ditched, one of them being crushed. Thirteen persons were killed or fatally injured (including the motorman of the second car, who died the next day) and 30 or more persons were injured. The cars were crowded, the company having sold 1,500 tickets to the mountain resort on that day. Motorman Dodge of the runaway car was an employee in the company's barn, and was only serving temporarily as motorman. The grade of the line from the upper terminus to the point of collision, about one and one-half miles, is from seven to eight per cent. most of the way, and there are numerous very sharp curves.

As we have already said, the particular details of this accident cannot now be discussed, and it is possible that the evidence may never be made clear, because of the death of the motorman and other persons who might know the facts; but of the main fact, a combination of untrained men and insufficient brakes, the evidence even now is all too plain. Taking risks seems to be inseparable from locomotion, with the great majority of people. The spirit of the thoughtless pedestrian at a highway crossing and of the scorcher on his bicycle seems to animate the motorman and the street car manager. It is found in the locomotive runner, the freight brakeman and the railroad superintendent, too; we are not trying to heap on the street railroad man's back all of the sins in this catalog. The fact that the Manhattan elevated road in New York has by the exercise of care and foresight carried in its cars a half million passengers a day for twenty years without ever killing one of them; the fact that the enormous traffic of 20,000 miles of railroad in England is carried on for a whole year without a single train accident fatal to passengers, and that out of the half million railroad employees in Great Britain only 8 were killed in train accidents in a whole year—facts like these seem to appeal to a great many people as only idle tales. The officers and employees responsible for collisions like those under consideration apparently never heard of these records; or, if they have heard of them, they deem the methods of such conservative roads too "slow" for an enterprising American establishment. And the American trolley-car manager who believes that his highest duty to the public is to be able to offer the longest and most varied rides for five-cent fares, leaving air-brakes and expensive refinements of discipline to take care of themselves, doubtless rejoices in the sympathy of the steam railroad officer who thinks that the English roads have spent unwarranted millions in maintaining a higher degree of safety than the public deserves, or can afford to pay for.

The lesson of runaways is simply good men and good brakes. Good material in cars, wheels, brakes and brake chains, and intelligent inspection, we may presuppose, or at least we ought to be able to presuppose such simple elements; though it is true that on level street railroads, where runaways are impossible, the neglect of these does not usually bring a severe penalty; and the lax methods thus engendered often spread to roads which are not level. "Good men" means men trained both by precept and experience. A careful superintendent does not trust a man on a

*The last prominent runaway accident that we have had occasion to report is that which occurred at Allentown, Pa., in December last, where five persons were killed and ten injured. In at least two-thirds of the monthly articles on train accidents which we published during the year 1901, mention was made of serious losses of life by street-car accidents. In January there were three runaways, though only one of them resulted in fatal injuries. In May occurred the butting collision on the Albany & Hudson road, killing five and injuring 60. The June record included one runaway, where there was a "catch point" or derailing switch which is said to have failed because it was out of order. In July six persons were killed in electric car accidents, though there is no mention of a prominent runaway that month. In August the total number of persons killed in electric car accidents was 14 and of injured 166. One of the August accidents was a collision due to a runaway freight car; this car was a standard steam railroad freight car, heavily loaded. In October the number reported killed was eight and injured 69; one of the accidents was a collision reported as due to the failure of a brake chain. In November four persons were killed and 43 injured, and in December, including the Allentown case, before mentioned, there were 10 killed and 49 injured. In January, 1902, there were five runaways, including two occurring on the same hill within a few minutes of each other. In these two smash-ups five persons were killed. In February there was one runaway, which was reported as due to the failure of both the air and the hand brakes. In this present month of July, besides the Gloversville disaster, there was a collision at Lake George, N. Y., killing one and injuring 20. The Stratford (Conn.) disaster, killing 29, occurred in 1899; and Tacoma, killing 51, in 1900.

steep grade until he has been thoroughly tested on levels and moderate grades. The "average" street railroad superintendent evidently ignores this principle or, what is just as bad, preaches it to himself as a theory, and practices it when convenient, but suspends it without a protest when there is a rush of traffic. This one vice of shutting your eyes to the lessons of experience because the alternative seems to be the loss of some good ticket money for a day or two, has caused a great many fatal collisions on steam railroads, and the lesson is as plain as a pikestaff. When trains are thickest and the work hardest, then trust loads of passengers to those of your men whose competency is most doubtful; this has been the case in unnumbered instances on steam railroads, and the lesson has been very slowly heeded. But the street-railroad men may get the benefit of it in a single day if they wish to.

The brake problem is in some respects harder on the street car, for the steam railroads have always had the great benefit due to alternative brake power. Always running vehicles in trains, they have always been able to do some braking, even if one or two brakes failed. Even with this safeguard, experience has taught the wisdom of certain safeguards on steep grades, and the best roads employ them; a rigid speed limit, experienced men (as before mentioned), special inspection of apparatus and trial of brakes before starting; special records of inspection and special attention from supervising officers. If all these are necessary with trains, how much more necessary with a single car; and if necessary with freight trains in the Rocky Mountains, to save cars of merchandise, why not necessary in handling passenger cars on steep hills everywhere? The Gloversville grade is steeper than the grades in Colorado where the steam roads take these elaborate precautions. This makes the problem harder than in Colorado, and it does not appear that there is anything about the street car problem that makes it easier than the Colorado problem. Being harder any neglect of it is the more reprehensible.

The street railroads have as yet hardly begun to avail themselves of the advantages of the power brake. The chief benefit of the power brake is in regular service, rather than emergencies, and we need not go into a full discussion of it in this place; but it is to be noted that, aside from the saving of some seconds' time in application—which may be vital when a disaster impends—an air-brake, with its stored power, capable of being applied from either end of a car, is almost equivalent to a third man—for in the event of the neglect or inability of the conductor to act (when the motorman neglects or is disabled) there is a good chance that a passenger may apply the brake. On a crowded car the fact that the whole brake-power can be applied by a turn of a six-inch lever, or by pulling a cord, may be a vital advantage, for the manipulation of the hand-brake wheel or lever is often interfered with by the press of passengers.

Whether an electric car has a power brake or is to be controlled wholly by the hand brake, the discipline needs constant attention. A regular drill is necessary; as necessary as it is in the case of the air-brake on steam cars, which we had occasion to mention quite recently. With a power brake the conductor must be trained to apply the brake, on steep grades, as soon as he suspects danger—not after he has waited three or four seconds to see whether the motorman cannot manage the car without assistance. On very steep grades the conductor should make the movement of the car his first care. To devote himself to taking fares, thus making safety secondary, comes pretty near to inviting disaster. If there is no power brake, it is necessary not only to have the alternative brake at the rear of the car, but to have the conductor keep his hand on it during the whole descent. If he is ten feet away, and there are half a dozen passengers on the rear platform, the so-called safeguard is worse than useless, for a false dependence is placed on it.

How can an outraged public enforce the observance of these simple safeguards? Why, says the legislator, pass a law requiring the use of the latest and most improved brake; requiring the appointment of motormen from among the members of a motormen's brotherhood, and providing for State examination and licensing of motormen. This seems simple enough; and propositions of this character (in regard to steam roads) are offered in the legislatures every winter. Why not? Perhaps the most practical answer to this is that the object sought would not be attained, or would be attained only at the expense of a loss in some other direction. The regulation of safeguards by law may result in promoting safety at the expense of progress. It is a crude method of regulation. Neither will a State board of commissioners fill the bill. There is a temptation to believe that with a competent railroad commission, the looseness of the present situation, on the one hand, and the rigidity of a statute, on the other, could be avoided; but there is little evidence to support this view. We do not find any public railroad commission that can exercise expert judgment on every question. Even the experts of the British Board of Trade are criticized as being unpractical idealists. The selection, training and disciplining of employees cannot be dealt with at second hand or at long range; and yet discipline is a vital factor in this matter. The State cannot regulate the conduct of the employees of a railroad unless it directly manages them; and it cannot manage them without relieving the railroad company of its responsibility.

In thus pointing out a fundamental weakness of the commission theory we do not, of course, forget the useful function of a thoroughly impartial and enterprising State commission in securing all needful publicity concerning railroad operation. For example, in the matter under discussion, the exact condition of the cars of all electric railroads ought to be regularly laid before the public, in such detail as circumstances may require.

But if the legislator's plan is not practicable, what next? If the State does no more than it does now, the only forces impelling a railroad or street railroad company to enhance the safety of travel on its cars are (1) economy in operation, (2) fear of heavy verdicts from juries when passengers are killed or injured, and (3) the moral character of the officers. The trouble with the last-mentioned is that morality and intelligence do not always go together. There appear to be innumerable directors of corporations who intend to carry passengers in safety, but who do not know how to go to work to do it. The first point, economy, is not susceptible of profitable discussion, because much of the negligence, or risk taking, or recklessness, that endangers passengers occurs only on rare occasions. Cars will be run with a fair observance of the necessary safeguards for 350 days in the year, but these will be neglected on the other 15 days. This being so, the economy of safeguards cannot be demonstrated, except by taking a long term of experience—longer than any one will pay heed to.

Severe punishment by juries in damage suits appears to be the only remedy that is universally applicable and universally understood and appreciated. It is to this remedy that we are to attribute much of the safety already attained and to which we must look for progress in the future. It is indirect, and often fails to do justice; but what better can any one suggest?

Juries seem to be giving larger and larger verdicts, year by year; but whether the actual sums finally recovered are likewise increasing it is impossible to say. Juries often give unjust verdicts against railroads, and this leads railroad lawyers to try to console themselves with the thought that the railroad is always abused; or at any rate that in the final net result the public gets more out of the railroads than it ought to. This, however, will not help them much, either with the courts or the public; and facts like those which we have given above are sure to engender a sympathetic feeling toward the people who suffer from accidents.

But if the public is going to depend, for safety in travel by electric cars, on the collection from the carrier of a lot of 50,000-dollar tributes after he has killed a lot of passengers—say $100,000 to $500,000 from a corporation in a single year—it will be well to see that the carriers have the money with which to respond. Some large steam railroad corporations have escaped paying judgments of this kind by going into bankruptcy about the time that a serious accident occurred. A trolley road with not $10,000 to its name can easily destroy $100,000 worth of lives—measuring by the courts' standards. If we are going to stick to the principle of the least practicable government oversight and the largest individual initiative and responsibility, we must logically go on and require carriers to deposit a large fund with the State treasurer, so that there shall be no failure to enforce responsibility. As we said at the outset, it is a discouraging fact that our present laws have failed to prevent some very bad accidents. The least that the people can do is to see that the law is surely and effectively applied in every case.

The Baltimore & Ohio has decided to employ no more women as stenographers in the operating department; but those now employed will not be disturbed. This is the substance of a report going the rounds of the newspapers; the reason assigned being that the management wants every employee in the operating department to be trained, or to train himself, for higher positions; and it is probably taken for granted that women would not be useful trainmasters or division superintendents. While there is sound business wisdom in this, there is yet another side to the question. The B. & O. has avoided the irritation which would follow an order like that of a certain other road, reported not long ago (which not only changed the rule but dismissed the women on short notice), and therefore cannot be criticized; but possibly there will be loss as well as gain. In the first place the best station agents, yard masters, conductors and enginemen will feel that training more men in the offices for the higher places which they (the outside men) aspire to, is an unnecessary trespass on their privileges—which are slim enough at best. There is jealousy enough already toward superintendents whose whole bringing up has been in carpeted rooms. Then, again, there are cases in plenty where a woman makes a more faithful, skilful and steady stenographer than a man; or, rather, where as good a stenographer can be had for less money than would be required to get a man. A man competent to fill the place is competent to get better pay at something else. This point is to some extent matched on the other side of the argument by the fact that women will resign to marry; but women stenographers who serve long terms with great satisfaction are also common. A very important objection to men is the fact that if they are trained and fit to fill better places they cannot be kept very long in the stenographer's chair; and the most important advantage in employing women—aside from lower wages—is in the greater likelihood that they will be contented. Further, you must yourself encourage your stenographer's ambition. And as soon as you take a lively interest in his prospects you are in danger of giving undue weight to his merits, as compared with, say, those of a division engineer, or a yard master, a hundred miles away, whom you do not know so intimately but who is in training, or trying to be, for the same places that the stenographer has his eye on.

The Rock Island Capital Plan.

One of the important incidents of the past week was the publication of certain particulars of a new capital plan for the Chicago, Rock Island & Pacific Railway. The facts that have come to light have as yet no warrant of official authority, but it is tacitly admitted that a plan is under consideration to be acted upon by the directors at a meeting this week (which had not been held at the time this article was written.)

As the matter has now come up, it is proposed to retire, or rather to convert, the present authorized capital stock of the Chicago, Rock Island & Pacific, amounting to $75,000,000, into new 4 per cent. bonds to the same aggregate amount. These bonds will be issued to the present stockholders at par for the now outstanding stock. In addition, the new company, which will be organized in the form of a security holding company, is to issue besides these bonds, preferred shares to the extent of 75 per cent. of the present Rock Island capital stock, or to the amount of $56,250,000; and also common stock for $75,000,000, the amount of the capital stock of the Rock Island now outstanding. This will give the new Rock Island Company outstanding securities for $206,250,000, replacing the present $75,000,000 outstanding capital stock of the present company. All of these new securities will be issued to the holders of this present stock and no new contribution of capital is asked of the stockholders in this distribution of new capital, or for any purposes under the new plan.

As thus outlined, the plan may be modified by action of the directors. It has been more or less criticised in Wall street and it is possible, if these criticisms seem to have weight, that changes may be made to meet the objections—for admittedly the whole purpose of the new plan is to secure a wider holding among the public of the securities of the Rock Island. The present stock has been concentrated in the hands of a small group of men who now control the policy of the company. An object of the plan is to enable them to release the larger part of the capital they have invested in Rock Island shares while retaining voting power.

How far this plan is founded on proper theories of finance need not be discussed here at this time, and certainly could not be examined in detail with intelligence or with fairness until final action by the directors. It may, however, be of interest to briefly indicate the history and the conditions of the Rock Island in the last year or so which have led up to the present proposals for readjusting its capital stock by issue of a great volume of new securities.

It is a matter of public knowledge that the policy of the Rock Island Railroad is now dominated by the so-called Moore interests of Chicago and their associates, and it is currently believed that they have acquired actual ownership of considerably more than the majority of the total present capital stock. This was acquired wholly or chiefly in the early months of 1901, when speculation in Wall street went beyond any precedents. The Moores and their associates had become very wealthy through the organization and promotion of steel manufacturing companies which had been absorbed into the United States Steel Company, realizing to the promoters substantial profits, which in this case were invested largely in the stock of this one railroad.

These new interests secured representation on the

Rock Island directorate at the annual meeting in June, 1901, and increased representation gave them an absolute majority during the ensuing year. At present, at least seven of the 13 directors of the Rock Island are distinctly representatives of the new interest, as is also a majority of the executive committee. The president of the company, Mr. W. B. Leeds, is one of the leading members of this group. Mr. Leeds was a division superintendent of the Pennsylvania Railroad in Indiana for a number of years, until a business venture which he had made in a tin plate plant at the time the McKinley bill placed a prohibitive tariff on the importation of tin plate, had grown largely profitable. This was one of the plants afterwards turned over to the American Tin Plate Company, now one of the constituent properties of the United States Steel Corporation.

One of the policies of the present management of the Rock Island has been the unification of the system, and they have also adopted an aggressive policy, pushing the company's lines into new territory and developing and protecting that already occupied. The long extension from Liberty, Kansas, to El Paso, Texas, completed in the early part of this year, had been planned for and was under construction before the change in control was effected. It would appear, however, that the other new work undertaken in the last year or so has had its initiative largely in plans formed by the present management. One of the most important of these operations has been the acquisition of the Choctaw, Oklahoma & Gulf, a road of about 1,300 miles, chiefly in the Indian Territory and Oklahoma, and mostly of recent construction. This was secured by paying a considerable premium on the outstanding stocks of that company, the Rock Island authorizing the issue of $24,000,000 of 4 per cent. bonds for approximately $15,800,000 capital stock of the Oklahoma Railroad, which in 1901 had paid 5 per cent. dividends on its preferred stock and 4½ per cent. in cash, with 10 per cent. in stock, on its common shares.

One of the most recent moves of the Rock Island Company has been the purchase of St. Louis, Kansas City & Colorado, extending out of St. Louis for a short distance in the direction of Kansas City. This line is to be completed to that city to give the Rock Island a route into St. Louis. It has heretofore had no connection of its own into St. Louis. Supplementing this plan for a St. Louis extension, there were heavy purchases of stock of the Wiggins Ferry Company, which owns valuable freight terminals at St. Louis, and a Mississippi River freight transfer. Whether the effort to secure a majority of that stock was successful has not become known; rival interests attempted to defeat it by counter purchases of the Wiggins Company stock. At all events, the Rock Island has been successful to this extent at least: It has secured the consent of the railroads among whom the control of the Terminal Railroad at St. Louis is vested, to a grant of membership in that association and the right to use the terminals at St. Louis controlled by the Terminal Association, and presumably also the terminals controlled by the Wiggins Ferry Company.

Mr. Cable has been quoted in the newspapers as definitely stating that the Rock Island would put under construction an extension from Fort Worth to Galveston, or some other point on the Gulf of Mexico in that vicinity, and it seems also practically certain that the company will undertake the construction of new lines in Illinois to connect St. Louis and Peoria, and thus form a new short route between Chicago and St. Louis. Directors of the company have this week, in connection with the announcements of the new capital-plan, made the statement that the Rock Island Company would shortly take over another extensive western system. The identity of this system has not been disclosed, but it may be the Colorado & Southern, which would fit in exceedingly well with the Rock Island system, particularly with its recent southwestern extensions and the purchase of the Choctaw Railroad.

With these aggressive movements and extensions in various sections, the present management has formulated and practically carried through a plan for the unification of the older Rock Island system. They have arranged, for instance, to merge with the company the Burlington, Cedar Rapids & Northern, and the Rock Island & Peoria. These two lines the Rock Island has long owned, through ownership of the majority of the stock in each case, but they have been managed as distinct companies. Part of the latest issue of Rock Island capital stock, $15,000,000, authorized at the annual meeting of June last, was appropriated for exchange at par for the stocks of these two companies. In June, 1901, when control of the Rock Island changed, the outstanding capital stock was $50,000,000. At the annual meeting in June, 1901, an issue of $10,000,000 stock was authorized and sold to shareholders at par, the proceeds being devoted to the El Paso extension and other purposes of the company. The issue of $15,000,000 authorized in June last brought the capital up to the $75,000,000 now outstanding.

The present Rock Island Company operated 3,910 miles of road on March 31 last; the Burlington, Cedar Rapids & Northern operates 1,277 miles; the Rock Island & Peoria about 118 miles; the Choctaw, Oklahoma & Gulf, with extensions under way, about 1,300 miles; and the El Paso extension, the line to Galveston and other new work, will bring the mileage of the new Rock Island Company up to about 8,000 miles. The Rock Island in its 1902 fiscal year reported a surplus over charges of $7,220,900, and the surplus of the other companies, now included in the system, would have brought the surplus up to about $8,739,000, allowing for interest on the bonds issued for the stock of the Choctaw Railroad.

London's Underground Railroads.

Everyone who has studied the position and working of the Metropolitan and of the Metropolitan District Railways has been convinced that a fusion of the two companies would be to their mutual advantage. The two lines are really portions of one system, and each is necessary to the other. The reader will remember that the interests now controlling the District last year put forward a scheme by which the Metropolitan District Traction Company offered to guarantee a dividend of 3½ per cent. upon Metropolitan stock. This suggestion, although unacceptable, showed the desire of those now controlling the District for closer relations with the allied line. Further, at the meeting of the Metropolitan in February last, Mr. Mellor, the chairman, gave expression to his desire to come to an arrangement. Inasmuch as both companies desire to come to an arrangement with the other, is it not time that steps were taken to bring about a fusion? Moreover, if in times past it was desirable that the two companies should be worked as one system, it is now absolutely essential. Both companies have to face keen competition, and the competition may become still more intense through the construction of additional electric railroads, which may for a time, at any rate, divert traffic both from the Metropolitan and from the District companies.

To show what have been the earnings of the Metropolitan in the past four years, its expenses, charges and profits, we give the following:

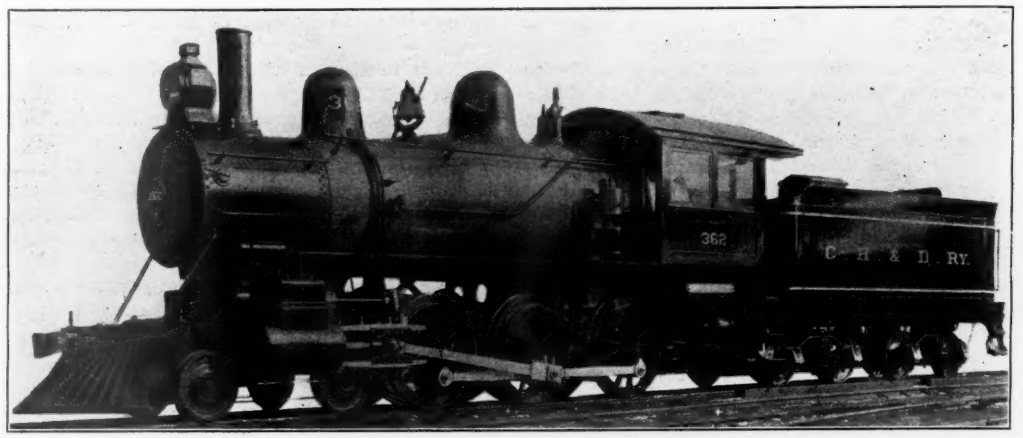
	Metropolitan.			
	1901.	1900.	1899.	1898.
	£	£	£	£
Gross earnings.....	820,000	866,000	861,000	834,000
Expenses	417,000	413,000	388,000	368,000
Net earnings.....	403,000	453,000	473,000	466,000
Miscellaneous	28,000	28,000	43,000	40,000
Total	431,000	481,000	516,000	506,000
Total charges.....	304,000	299,000	297,000	297,000
Net profit	127,000	182,000	219,000	209,000
Ordinary dividend..	*129,000	†179,000	‡218,000	§206,000
Train mileage	3,192,000	3,202,000	3,148,000	3,128,640
Ordinary stock.....	5,732,000	5,732,000	5,732,000	5,507,000

* 2¼ per cent.; † 3⅜ per cent.; ‡ $3^{13}/_{16}$ per cent.; § 3¾ per cent.

Beneath we set out the gross earnings, expenses, net earnings and profits of the Metropolitan District for the past four years, from which it will be seen that in consequence of the construction of the Central London and of the London United Tramways its gross earnings, which amounted to £434,000 in 1899, were only £380,000 last year, and that its net earnings fell from £220,000 in 1899 to £154,000 last year:

	Metropolitan District.			
	1901.	1900.	1899.	1898.
Gross earnings.....	£380,628	£416,142	£434,379	£433,579
Expenses	226,280	217,418	213,890	213,649
Net earnings.....	154,348	198,724	220,489	219,930
Miscellaneous	30,099	20,037	16,358	14,620
Net income	184,447	218,761	236,847	234,550
Debenture interest, rents, etc.	151,074	150,197	150,511	150,412
Net profit	33,373	68,564	86,336	84,138

—*The Statist.*



Ten-Wheel Freight Engine for the Cincinnati, Hamilton & Dayton.

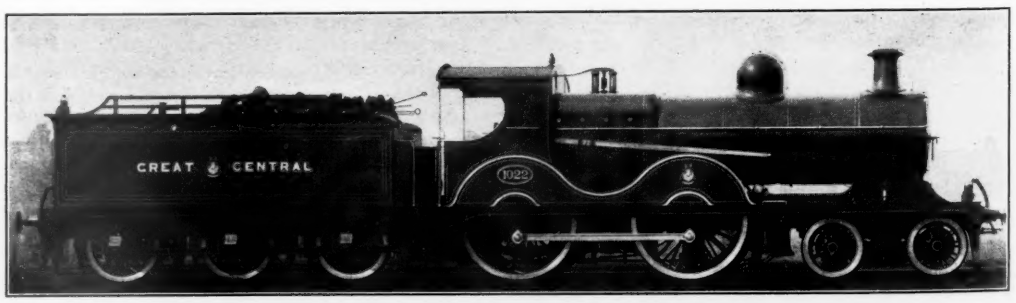
Ten-Wheel Freighter for the C. H. & D.

The Cincinnati, Hamilton & Dayton has recently received some engines from the American Locomotive Company which were built at the Pittsburgh Works. They are 10-wheelers, with extended wagon top boiler, and 19 x 26-in. cylinders. The pressure carried is 180 lbs. The side-rods, which are of the solid end type, are slightly tapered from the center, each way. The tender trucks are of the diamond pattern with composite bolsters resting on elliptic springs. The tender frame is made of steel; 5,000 gallons of water and 12 tons of coal can be carried. The half-tone illustration from a photograph gives a good idea of these engines. A few of the principal dimensions are appended:

Fuel	Bituminous coal
Gage of track	4 ft. 8½ in.
Total weight of engine in working order	135,000 lbs.
Total weight on drivers	110,000 lbs.
Driving wheel base of engine	12 ft. 0 in.
Total wheel base of engine	37 ft. ⅞ in.
Height of stack above rail	14 ft. 5¾ in.
Diameter and stroke of cylinders	19 x 26 in.
Type of boiler	Extended wagon top
Diameter of boiler at smallest ring	60 in.
Diameter of boiler at back-head	70⅛ in.
Crown sheet supported by radial stays	1⅛ in. diam.
Staybolts	1 in. diameter, spaced 4 in. centers
Number of tubes	276
Diameter of tubes	2 in.
Length of tubes over tube sheets	12 ft. 5½ in.
Length of fire-box	96 in.
Width of fire-box	40 in.
Boiler pressure	180 lbs.
Kind of grates	Cast iron, rocking
Grate area	26.6 sq. ft.
Heating surface in tubes	1,788 sq. ft.
Heating surface in fire-box	149 sq. ft.
Total heating surface	1,937 sq. ft.
Diameter of driving wheels, outside of tire	57 in.
Diameter and length of journals	8 x 10 in.
Diameter of engine truck wheels	30 in.
Diameter and length of journals	5½ x 10 in.
Type of tank	Level top
Water capacity of tank	5,000 gals.
Fuel capacity of tank	12 tons
Weight of tender with fuel and water	106,000 lbs.
Type of tender truck	Diamond, with P. L. W. composite bolsters
Draft gear on rear of tender	P. L. W.
Type of brakes	Westinghouse

New Great Central Engines.

The Great Central Railway Company, whose new line to London has been several times mentioned in the *Railroad Gazette*, has lately brought out a fine class of express engines, the first designed by the new locomotive superintendent, Mr. J. G. Robinson. This gentleman, who joined the line about two years ago, completed the 7 ft. 9 in. single-drivers engines which had been designed by Mr. Harry Pollitt, illustrated in your columns July 12, 1901. Mr. Robinson, apparently, does not believe in single-drivers. Only six were built, after which came 40 goods engines designed by Mr. Robinson, and the new express engines. These have Belpaire fire-boxes with 130 sq. ft. of heating surface, 1,248 sq. ft. of heating surface in the tubes, total 1,378 sq. ft., and 21 sq. ft. of grate area, and a boiler 4 ft. 9 in. diameter outside the smallest ring. The slide-valves are placed above the cylinders, not on the top, but sloping towards each other, like a V. Four slide bars are used to each cylinder, and there is sand-blast apparatus for increasing adhesion. Driving-wheels 6 ft. 9 in. diameter are used, the bogie wheels being 3 ft. 6 in. The cylinders are 19 x 26, and the boiler pressure 180 lbs. When full, engine and tender weigh 97 tons 4 cwts.; 53 tons 1 cwt. being the weight of the engine, and 44 tons 3 cwts. that of the tender, with coal supply and 4,000 gallons of water. A cab of somewhat unusual design and dimensions shelters the men. It is provided with pillars at the corner. The engines are being built by Messrs. Sharp, Stewart & Co., of Glasgow. Some of them run from London regularly with certain expresses, others continuing the journey between Leicester



Express Locomotive for the Great Central Railway Co.
Designed by J. G. Robinson, *Locomotive Superintendent.*

and Manchester. Mr. Robinson's new goods engines are being built by Messrs. Neilson, Reid & Co., of Glasgow, and are very similar to the passenger class just described. The cylinders are 18½ x 26, the boiler pressure 180 lbs., but the boiler is 5 ft. over the smallest ring, the tubes giving 1,300 sq. ft. of heating surface, the fire-box 124 ft., making a total of 1,424 sq. ft. The grate area equals 19½ sq. ft. Six coupled wheels 5 ft. 1 in. diameter, with new 3 in. tires, are employed. The wheel-base is 17 ft. 1 in. over all. These engines take heavy loads and are giving particular satisfaction. They are fitted with steam brakes. The leading axle-boxes have been given a certain amount of side-play to ease the engine in going round curves. The boiler, as well as the fire-box shell, are of steel plates, ⅝ in. thick, the inner box being of copper, with stays of the same material. Steel axles are used, 9 in. in diameter at the wheel seats, 8 in. at the journals. The goods tenders carry 3,250 gallons of water, but more coal than the passenger tenders; the total weight of the goods engines and tenders in working order being 92 tons, 6 cwts.

Other types of engines are in hand, though not yet completed. Undoubtedly the Locomotive Department of the G. C. R. will be brought thoroughly up to date. The company has already been able to dispense with the large number of engines they had on hire, and the London extension will certainly do more business the better it becomes known. W. B. P.

LONDON, April 28.

The Seattle Railroad Tunnel.

The Seattle & Montana, which is part of the Great Northern system, has filed the documents giving the first details of the proposed tunnel under Seattle, Wash. When completed, it will be used by all the railroads entering the city from the general direction to which it runs. This is one of the conditions on which the City Council will grant the franchise. In return for the privileges asked, the company will guarantee certain improvements to the city. Overhead viaducts will be built at the intersection of its tracks, and temporary viaducts are to be ready when the line is laid across these thoroughfares. Owners of wharves or warehouses near the track will be allowed a side track to connect them with

The Seattle Tunnel.

the main line. A new passenger station is also to be built to cost not less than $200,000. The right of way for each of the tracks in the tunnel will be 15 ft. wide. The easterly portal of the tunnel will be situated in the block lying between Virginia street, Western avenue, Stewart street and Elliott avenue. The central line will then run in an easterly and southerly direction, as shown in the drawing, to the western portal which will have terminal grounds at King street. The tunnel is to be of such dimensions that, after it has been lined with suitable walls and ceilings of concrete, it will have a clear width of not less than 30 ft. There will be two main tracks connecting with the Seattle & Montana and Seattle & International Railroads on Railroad avenue. Work will begin within three months after the ordinance has been passed.

TECHNICAL

Manufacturing and Business.

Barber trucks have been specified for the 1,000 steel gondola cars to be built for the Erie by the Standard Steel Car Co.

W. S. Hammond, formerly with the Pennsylvania Railroad, Pittsburgh, Pa., is now connected with the western office of the Consolidated Car-Heating Co.

The 700 cars referred to in our last issue as being built at the works of the American Car & Foundry Co., and equipped with Thornburgh Coupler attachments, should be credited to the shops of the Atlantic Coast Line.

The Jones-Laughlins Co. was reorganized at a meeting held at Pittsburgh, July 23, and it is said that the capital stock will be increased from $20,000,000 to $50,000,000, providing for extensions and improvements. There will be no change in the officers.

E. T. Morris, formerly Division Engineer of the Chesapeake & Ohio, has become Manager of the firm of Langhorne, Johnson & Company, Contractors, for an 85 mile extension of the Big Sandy District of the Chesapeake & Ohio. Mr. Morris' office will be at Prestonsburg, Ky.

The Pennsylvania Tool Works Co. was incorporated in New Jersey July 16, with a capital of $125,000. The company has a broad charter, which enables it to manufacture all kinds of tools. The incorporators are Milton S. Zortman, F. Herbert Brown, Robert Wray and Joseph A. Langfitt, of Camden, N. J.

The plans for the new plant of the Cleveland Pneumatic Tool Co. are about completed, and contracts will be let at an early day for the construction of the buildings. The company has just opened an office at 411 Park Building, Pittsburgh, Pa., represented by Chas. L. Nelson, and at 34 Lemoine street, Montreal, Canada, represented by N. J. Holden.

General Manager A. M. Kittredge, of the Barney & Smith Car Co., Dayton, Ohio, reports the greatest activity in every department of the works. Large orders of passenger cars from the Illinois Central, the Great Northern and the Kansas City, Mexico & Orient are building, as well as 1,500 coal cars for the Hocking Valley. Two thousand men are employed in the works at the present time.

Mr. D. L. Markle, notice of whose appointment as General Manager of the Western Steel Car & Foundry Co. appeared in our columns July 11, has issued a notice of the removal of his office to Hegewisch, Ill., where the plant of the company is situated. Visitors will be received between 1 p.m. and 4 p.m. daily except Saturday, and all correspondence pertaining to the sale and shipment of materials to the company should be addressed to him at Hegewisch.

Iron and Steel.

By mutual agreement the suit against the United States Steel Corporation to enjoin the preferred stock conversion plan has been postponed until Sept. 5.

Jones & Laughlins Steel Company was reorganized at a meeting held in Pittsburgh, July 23. The capital stock will be increased from $20,000,000 to $50,000,000, and improvements and extensions are contemplated. There will be no change in the officers.

The Iron Age in its issue of July 25 says: The rail tonnage for next year continues to pile up. Additional orders have been placed during the week, and the contracts booked for 1903 are now considerably above 1,000,000 tons, exclusive of the business taken by the Colorado mill. Inquiries covering large lots are still in hand, some roads asking for a much larger quantity than they have ever before purchased at one time. This shows that the heavy orders have by no means been exhausted. The purchasing power of the railroads and their disposition to continue to make improvements are shown by the fact that heavy orders are coming up for bridge work for next year. The Burlington is stated to be in the market for 50,000 tons. The Atchison road a short time since placed an order for between 50,000 and 60,000 tons. It is necessary now to place orders for next year's delivery by those who desire structural material if they wish to make themselves certain of securing it. Foreign business in beams is increasing, and it is expected that importations will grow larger for some time instead of smaller.

Commonwealth Steel Company.

The buildings of the Commonwealth Steel Co., described last week, are up and under roof. All of the small cranes are in position, and furnaces will be completed Aug. 15; taking orders for delivery beginning Sept. 1.

Another Alleged Explosion of Gas.

Telegraph accounts of the wreck on the Pan Handle Road near Xenia last week, said that the burning of the wreck was either caused or intensified by explosion of gas tanks. An investigation reveals the fact that there were nine Pintsch tanks on the train, four on one Pullman, two on another and three on a coach. There was no explosion or breakage of tanks whatever. Two were dented on one side, and seven are uninjured except the paint. Other newspaper reports have said that in the wreck on the Rock Island near South Omaha a gas tank exploded. Official information from the railroad says that nothing of the sort happened. There was no explosion. It is easy to see how stories of this sort may start honestly, because of the smell of escaping gas from broken pipes, and the odor of a little gas will go a long way.

Ball Bearings.

A long-distance test of Howe & Owen ball-bearing journals is being made by the Illinois Central on a car recently shipped from Granite City, Ill., to New Orleans, La., loaded with 75,000 lbs. of castings from the American Steel Foundry Co. It is claimed that but one-fifth of the power is required to move one of these cars as compared with the car equipped with the ordinary bearings. The car is to be loaded at New Orleans for Chicago, and it is expected that if this test proves satisfactory other cars of the Illinois Central will be equipped with the ball-bearings.

The Passaic Rolling Mills.

The newspapers have said that the Passaic Rolling Mills (at Paterson, N. J.) have been bought by the Fuller Realty & Construction Co., now forming in New York with an enormous capital. This is not true. It is true, however, that certain persons have taken options on the stock of the Passaic Rolling Mills Co. from individual stockholders, and have put up a cash forfeit. The Fuller Company has nothing to do directly with these options, and whether or not it is behind the matter is guess work.

The Pennsylvania Tunnel in New York.

On Tuesday of this week a conference was held in New York between officers of the Pennsylvania Railroad, some of the officers of the City Government and representatives of the Rapid Transit Commission. The Mayor is reported to have said that agreement is in sight upon all the terms of a franchise except the matter of the perpetuity of the franchise and the provisions concerning hours of labor and rates of wages. He has said that the Pennsylvania Railroad will grant the use of the tunnel for fire and police telegraph wires, will permit a fixed limit of time within which the franchise must be availed of, will agree that the sanitary control of the tunnel shall be in the Department of Health, will agree that at the end of twenty-five years the question of compensation may be taken up upon a new basis, and, finally, that the franchise shall always be controlled by a company organized under the laws of the State of New York.

THE SCRAP HEAP.

Notes.

On the morning of July 22 a train of the Mexican Central was stopped by robbers near Bermijilo. It is said that they got from the express car $50,000 in Mexican currency.

The State Railroad Commissioner of Ohio now has on his staff an inspector, who goes about on the railroads of the State examining freight cars with a view of observing the degree of fidelity with which the roads comply with the State laws prescribing and regulating safety appliances. This inspector would appear to be duplicating the work of the Federal inspectors.

Vice-President Van Etten, Manager of the Boston & Albany, lately took a large company (4 c.l.) of local freight agents of the New York Central and the Boston & Albany over the lines of the latter road, the principal feature of the excursion being an inspection of the terminals at Boston and East Boston. The object was to make the men from west of Albany acquainted with their new Yankee brethren and familiar with the Central's new foreign "possessions."

Seneca, Mich., the station on the Wabash Road where occurred the terrible collision of Nov. 27 last, has had its name changed to Ennis. The change appears to have been made on the supposition that the similarity of sound between Seneca and Sand Creek may be, or may have been, the cause of errors in reading telegraphic train orders. A newspaper account says that an error of this kind is what led to the November collision, but such an explanation has never been heard of before, and no mention was made of it at the time.

Not many months ago $1,000 was willed to a conductor of the Chicago & Alton for being courteous. A somewhat similar circumstance has just occurred on the same road. Mr. H. J. Titus, a steward on one of the Alton's dining cars, recently had for a guest a gentleman to whom he unconsciously gave such polite attention as to attract his patron's notice. Upon arrival of the train in Chicago, this passenger, who was an officer of the Mobile & Ohio, repaired to the general offices of the Chicago & Alton, and being assured of Mr. Titus's ability, promptly appointed him Superintendent Commissary of the Mobile & Ohio. Mr. Titus assumes his new duties Aug. 15, with headquarters in Jackson, Tenn. He will probably be the youngest superintendent of dining-cars in the country, his age being 24.

River and Harbor Estimates.

Among the reports from engineer officers engaged on river and harbor works, and the larger estimates for the fiscal year 1904, received by the Chief of Engineers, U. S. Army, last week, were the following:

Chicago District.—Lieut. Col. O. H. Ernst, from the Chicago district, estimates for 1904, for Chicago harbor $210,000, and to complete the project, $457,965. Calumet harbor, $204,480, which will complete it. Calumet river, $260,000, and to complete the project, $423,822. No estimate is made for the Chicago river, as $507,954 is already available. Col. Ernst says that the slope of the river has been changed and the depth reduced, but the Sanitary District has agreed to remedy this by dredging. Periodical dredging will be necessary to maintain the river as a navigable channel, and this dredging he thinks the City of Chicago should do, and not the Government, the Sanitary District not having accepted responsibility for any but the south branch of the river; therefore no estimate for maintaining the channel by the Government is submitted. It is proposed to use the balance available for two turning basins, one in the south branch near its junction with the south and west forks, and the other on the north branch near the head of Goose Island. The report says that while the volume of business on the river was slightly greater this year than last year, yet with that exception it was less than any year since 1893. This decline has been steady and is bound to continue unless the obstructions to navigation in the river are removed; the system of improvement now going on will accomplish little unless the tunnels under the river are removed, as they only permit vessels drawing 16 ft. to pass over them, and no lake port which cannot accommodate vessels drawing more than 16 ft. of water can hold its own now. Chicago should remove the tunnels without further delay if she is to arrest the decay of her lake shipping, which has been going on for 10 years.

New York.—Additional estimates for New York har-

bor submitted by Maj. W. L. Marshall are: For general improvement, $100,000; for Ambrose channel, $340,000, to complete the project, $2,720,000; Bay Ridge and Red Hook channels, $348,000, to complete the project, $1,898,000. The report says that the improved channels by way of Sandy Hook have a full depth of 30 ft. and 1,000 ft. wide. Work on Ambrose channel continues with success and improvements have been made at Governor's Island by building wharves and dredging so that large vessels can approach the island, and it is proposed to enlarge the island by building bulkheads on some ground under water that has been given by the State of New York, the entire project to cost $685,000, of which $400,000 will be needed next year.

Boston, Mass.—Lieut. Col. W. E. Stanton estimates for Boston harbor, general improvement, $100,000; for project of 1900, $750,000, to complete project, $7,394,248; Mystic River below the mouth of Island End River, $133,544; Lynn, Mass., for 15-ft. channel, $75,000.

Ohio River.—Col. G. L. Lydecker estimates for maintaining 1,000 miles of river, $400,000; for further improvement, $600,000; lock and dam No. 37, $500,000.

Lake Harbors.—Maj. D. C. Kingman for the Cleveland, Ohio, district, estimates for Cleveland harbor $350,000, to complete the project, $4,276,756; Fairport harbor, $200,000; Ashtabula harbor, $123,520; Conneaut harbor, $100,000.

Capt. D. D. Gaillard estimates for Duluth, Minn., district, Duluth, Minn., and Superior, Wis., harbor, $670,000; Ashland, Wis., harbor, $80,000; harbor of refuge, Grand Marais, Mich., $83,401.

Middle Western States.—Maj. E. H. Ruffner estimates for the Cincinnati, Ohio, district, for Muskingum River, Ohio, $110,000; Big Sandy River, West Va., and Ky., $53,000, to complete the project, $4,080,000; Kentucky River, Ky., $200,000, to complete the project, $2,135,000.

Lieut. R. R. Raymond, for the Montgomery, Ala., district, estimates for Pensacola River, Fla., $105,339; Coosa River, Ga., and Ala., $413,000, to complete the project, $1,123,523.

Maj. J. G. D. Knight, from the Chattanooga, Tenn., district, estimates for the Tennessee River, Chattanooga to Riverton, Ala., $406,000, to complete the project, $4,927,939.

Maj. R. L. Hoxie, for the St. Paul, Minn., district, estimates for the Mississippi River between St. Paul and Minneapolis $250,000; reservoirs at the headwaters of the Mississippi River, $205,000.

South Atlantic States.—Col. Allen, in charge of Potomac River improvement, estimates for the improvement of the Anacostia River, Washington, D. C., $320,000 for the fiscal year ending June 30, 1904.

Capt. Herbert Deakyne, for the Tampa, Fla., district, estimates for St. John's River, $200,000, to complete the project, $1,359,750; Biscayne Bay, $150,000; Key West harbor, $100,000; Tampa Bay, $140,000; various other rivers, $138,305.

Pacific Coast.—Lieut. Col. W. H. Heuer for the San Francisco, Cal., district, estimates for San Francisco harbor, $50,000.

Capt. Edgar Jadwin estimates for San Diego harbor, Cal., $192,350; deep water harbor, San Pedro Bay, $500,000, to complete the project, $1,593,108; San Luis Obispo harbor, $100,000.

Maj. John Mills, for the Seattle, Wash., district, estimates for Tacoma harbor, $100,000; New Whatcom, $55,000.

A Model of an Old Locomotive.

Through the courtesy of Mr. R. P. C. Sanderson, Superintendent of Motive Power, acting with the approval of Mr. J. M. Barr, Vice-President of the Seaboard Air Line Railway, Purdue University is in receipt of a full size model, accurate in all of its details, of an early locomotive. Mr. Sanderson says that the model represents the locomotive "Tornado," which was the second owned by the parent roads now forming the Seaboard Air Line Railway. It was bought in England and put in service in March, 1840. It has a single pair of drivers, a four-wheel truck, and a cylindrical fire-box. A tender carried on four wheel is attached.

Pressed Steel Car Company's Quarterly Report.

The statement of the Pressed Steel Car Company, covering the operations of the company for the June quarter, exceeds expectations. Net earnings were larger than those for the same period a year ago by $422,175, while the surplus shows an increase of $309,980. Net earnings after all expenses of operation, cost of ordinary repairs and all renewals of plant and machinery have been charged out were $934,093, less charges as follows: Interest for three months on outstanding mortgage and bonded indebtedness, $60,270; proportion of preferred stock dividend, $218,750; reserve for depreciation of works and properties, $63,273; total charges, $342,293; surplus for quarter, $591,800. The gain in net earnings is equal to about 45 per cent. and that in surplus to over 52 per cent. Up to July 23, when this statement was made, the company had turned out 100 cars per day, and it has business on hand to the amount of $14,000,000, which is sufficient to keep the plants busy until the end of November.

Early History of the "North-Western."

The Chicago & North Western having finished its double-track between Chicago and the Missouri River has taken the occasion to issue a history of the road that furnishes some interesting reading. Any one who has the idea that everything in the West is new may be surprised to know that the first railroad chartered from Chicago to the West was incorporated in Illinois in January, 1836, under the title of the Chicago & Galena Union, with authority to build a railroad from Chicago to Galena, Ill., then the leading city of the West. Evidently no great confidence in the project was entertained, even by the promoters, as a provision of the charter reads that the road "might, if desired, be made a good turnpike," instead of a railroad; and the incorporators were allowed three years in which to begin work. The first survey was begun in February, 1837, from the Chicago end, and was run for 10 miles to the Des Plaines River. The work was then stopped until the following year, when, after another effort, it was abandoned for 10 years. In the meantime Chicago was increasing in commercial importance and after several attempts by the people in the country immediately to the west to form some connection with the city, either by a canal or a plank road, the railroad scheme was revived; and during 1848, 32 miles of road were contracted for. In October of that year the first locomotive was landed from a lake brig which brought it from the East. This was named the "Pioneer," now among the exhibits of the Field Columbian Museum, Chicago. The road's rolling stock consisted of six freight cars, one passenger coach, and the "Pioneer."

Maps of the country now traversed by the North Western accompany the history, and give the condition of the region for each decade from 1852 up to the present, the first map giving the year of settlement of each important place. By January, 1850, the road had reached Elgin, 42 miles west of Chicago, and in 1852 and 1853 was built from Elgin to Rockford, and from Rockford to Freeport. Shortly after the completion of this much of the road, it was decided to build a more direct line to the Mississippi River. This line started at Turner Junction, now West Chicago, and was completed to the Mississippi at Fulton in December, 1855. The line was gradually pushed across Iowa, and finally, in 1867, reached the Missouri River at Council Bluffs, where it connected with the Union Pacific, which was then being built across the "Great American Desert."

In 1867 one passenger train a day was sufficient to accommodate the passenger traffic of the road. Twenty-eight hours were required to go from Chicago to Council Bluffs, 489 miles. When the Pacific roads were completed the journey from Chicago to the Pacific coast occupied four days and a half, or 109 hours. Comparisons of these schedules with those now required for these respective trips, and of the equipment and roadbeds of the two periods, form an excellent commentary on the splendid progress made in American railroad development.

Double-tracking on the North Western was begun in 1856, the first 30 miles being that from Chicago to Turner Junction. The second track reached the Mississippi River in 1890; and now, as mentioned in the beginning of this article, the double-track has been completed to the Missouri River, 350 miles beyond the Mississippi, and 489 from Chicago.

Purdue University Scholarship.

The St. Louis Railway Club proposes to establish a fund to be known as the Purdue University Scholarship Fund of the St. Louis Railway Club, the purpose of which is to maintain one student in Purdue University. Benefits under this scholarship amount to two hundred and fifty dollars a year, to be paid directly to the beneficiary. Out of money thus received, it is expected that the beneficiary will be able to pay his University fees, to buy all books, to suitably clothe himself, and to meet expenses of board, room, and all other incidentals. For any further information, address E. A. Chenery, Secretary St. Louis Railway Club, Fourth Floor Union Station, St. Louis, Mo.

A Heavy Train—On Paper.

In a daily paper the statement was made that a tandem compound locomotive on the New York Central drew one day last week, a train of 108 loaded cars containing 9,000,000 lbs. of freight, from De Witt to Albany, 143 miles, in 11 hours. This is a wonderful record, but unfortunately it is not true.

New Buildings at Army Posts.

The Board appointed several weeks ago by the Secretary of War to consider the construction of new buildings and the establishment of new posts, has made its final report, which has been approved by the Secretary of War. The amounts given below are those estimated to complete the various works, although the full amounts will not in all cases be spent during this fiscal year. The larger allotments are, in addition to those already mentioned in this column:

A new post at Haines Mission, Alaska, $260,000; a new post for a regiment of infantry on the military reservation at Monterey, Cal.; three new posts for coast artillery at Fort Worden and Fort Casey, Wash., at the entrance to Puget Sound, and Fort Rosecrans, near San Diego, Cal., each $120,000; quarters for a regiment at the Presidio, San Francisco, Cal., $75,000; enlargement of Fort Lincoln, near Bismarck, N. D., $90,000; enlargement of Fort Meade, S. Dak., $90,000; completion of Fort McKenzie, Wyo., $115,000; barracks, quarters, etc., at Fort D. A. Russell, Wyo., $200,000; enlargement of Fort Ethan Allen, Vt., $175,000; officers' quarters at Fort Myer, Va., $50,000; enlargement of Fort Douglas, Utah, $125,000; to begin the reconstruction and improvement of Fort Snelling, Minn., $250,000; to complete the post at Des Moines, Iowa, $240,000; enlargement of Fort Lawton, Wash., $105,000; enlargement of Vancouver barracks, Wash., $140,000; to reconstruct Fort Ontario, N. Y., $160,000; to enlarge Whipple barracks, Ariz., $120,000; to enlarge Fort McKinley, Me., $65,000; to continue construction of barracks and quarters at Fort Riley, Kan., and Fort Leavenworth, Kan.—at Riley, $225,000; at Leavenworth, $250,000. Plans and specifications will be prepared at once and bids will be asked for.

LOCOMOTIVE BUILDING.

F. M. Hicks has sold an engine, rebuilt by the Hicks Locomotive & Car Works, to the D. S. Pate Lumber Co.

The Hocking Valley has ordered 18 locomotives from the Rogers Works, and 12 from the American Locomotive Co.

The St. Louis & Gulf has ordered from F. M. Hicks a Mogul locomotive of 100,000 lbs. capacity, 19 x 24, rebuilt by the Hicks Locomotive & Car Works.

The Cincinnati, New Orleans & Texas Pacific is having two locomotives built at the Pittsburgh works of the American Locomotive Co., in addition to the order reported in our issue of April 18.

CAR BUILDING.

The Southern is sending out bids for material for 3,750 cars.

The Wabash is reported to be in the market for 1,500 cars.

The Chicago, Peoria & St. Louis is said to be looking for cars.

The Southern, it is reported, is in the market for 700 box cars.

The Boston & Albany is reported to be in the market for 25 coaches.

The Barry Lumber Co. has ordered eight freights from the American Car & Foundry Co.

The American Car & Foundry Co. has orders from different parties for 33 cars of various types.

The East St. Louis Suburban has ordered 100 coal cars of 80,000 lbs. capacity from the American Car & Foundry Co.

The Chicago, Indianapolis & Louisville, it is reported, is in the market for several hundred coal cars of 80,000 lbs. capacity.

F. M. Hicks has sold cars to the following roads: Chester, Perryville & St. Genevieve; Des Moines City Ry. Co., Texas Short Line, and Eastern Texas.

The Southern has ordered 20 vestibule coaches, 15 combination baggage and express, and six combination passenger and baggage cars from the American Car & Foundry Co.

The Rodger Ballast Car Co. have received an order from the Buffalo, Rochester & Pittsburgh for one of their standard double plow distributing cars, 32 ft. long, of 30 ton capacity.

The Chicago & Alton order for cars with the Standard Steel Car Co. reported last issue calls for 500 box cars of 80,000 lbs. capacity, and 300 flat cars of 100,000 lbs. capacity, with Universal bearings.

The Rodger Ballast Car Co. have received an order from the St. Louis & San Francisco for 98 Rodger Convertible ballast cars, Class C S, center and side dump, also two standard double plow distributing cars, for August delivery.

The Mobile & Ohio has 200 80,000 lbs. capacity gondola coal cars building at the American Car & Foundry Co. Approximate weight, 33,000 lbs.; 37 ft. 1½ in. long, inside measurement; 40 ft. over end sills. Width, 9 ft., over side sills. Height of sides, 45 in. To be built of wood (oak decking), with wooden underframes. Special equipment includes open hearth steel 5 x 9 journals, Bettendorf bolsters, Damascus brake-beams, Corning brake-shoes, Westinghouse brakes, M. C. B. lead-lined brasses, Buckeye couplers, Miner D 21 draft rigging, American dust guards, M. C. B. cast steel journal boxes, pressed steel journal box lids, Patterson, Sargent Co.'s iron-clad paint, four-coil double Pennsylvania H 59 springs, made by the Chas. Scott Spring Co.; M. C. B. standard arch bar trucks, and A. C. & F. Co. wheels.

BRIDGE BUILDING.

Allegheny, Pa.—An ordinance has been passed by the Select Council for rebuilding and relocating the Superior avenue viaduct over the railroad tracks from California avenue to Pacific avenue.

Anadarko, Okla. T.—Bids will be received Aug. 18 at the County Clerk's office, Anadarko, for five bridges of steel throughout, with stone and tubular substructure. Length of spans, four of 60 ft., one of 70 ft., two of 80 ft., and steel approaches. Clear width of roadway, 16 ft.; height of substructure, tubes, 25 ft. and 30 ft.; stone, 12 to 19 ft. Total estimated cost, $14,223. Certified check for 10 per cent. required with bid. For blue prints address Chas. H. Jones, County Surveyor of Caddo County.

Augusta, Ga.—A number of bridges over the canal in the City of Augusta are reported to be in bad condition, and it is said that they will be replaced at an early date with masonry arches.

Boston, Mass.—Bids will be opened Aug. 4 by the Metropolitan Park Commission for the new Wellington bridge, a part of the Middlesex Falls Parkway. The work includes 140 cu. yds. of first-class stone masonry, 1,800 cu. yds. of second-class stone masonry, 30,000 cu. yds. of wet excavation, and 14,000 yds. of earth grading.

Buffalo, N. Y.—Contract has been let to Henry P. Burgard for the substructure of the bridge over the city ship canal at South Michigan street. His bid was $53,900.

The Owego Bridge Co.'s bid of $9,400 was accepted for the new bridge over Cazenovia Creek, South Park avenue.

Chateauguay, Que.—Plans have been prepared by a Quebec engineer for a new steel bridge at Allen's Corners, to cost about $13,000.

Cincinnati, Ohio.—Plans have been submitted for the proposed Grandin Road Viaduct over Delta avenue, which provide for a structure 842 ft. long and 34 ft. wide, exclusive of 7 ft. sidewalk. The structure will be of steel truss and bands, 98 ft. long, supported by steel towers. The estimated cost is $216,000.

County Engineer Krug submitted specifications July 19 for a bridge over the Big Miami to replace "Lost Bridge," near Elizabethtown. The specifications give a total cost of $196,611.

Covington, Ind.—A proposition to build a $12,000 bridge across the Wabash at Cayuga, Ind., was carried by a large vote, July 20.

Delhi, Ont.—James Bell, C. E., has been instructed to prepare plans for a steel bridge to replace the Wimmer Bridge.

Dyersville, Iowa.—It is said that the bridge over the Maquoketa River will be replaced by a single span steel bridge 168 ft. long, to cost about $5,000.

Ellicott City, Md.—The County Commissioners have received a petition asking for an appropriation for a bridge over the Patuxent river, in Montgomery County.

Elyria, Ohio.—Sealed proposals will be received by the City Clerk until Aug. 18 for the improvement of the arch across the east branch of Black River in East Bridge street. Specifications may be obtained from the City Engineer. W. H. Park, Clerk of the Council.

Gilroy, Cal.—Plans are being made by County Surveyor McMillan, of San Jose, for two new bridges, one over the Carnadero, three miles south of Gilroy, and the other across the Llagas at the entrance to the town of Old Gilroy. Two sets of specifications will be prepared, one for stone and the other for steel.

Grand Rapids, Mich.—It is said that work will be begun during August on rebuilding the Pere Marquette railroad bridge over the Grand River.

Harrisburg, Pa.—The new Herr street subway, which is to be built by the Pennsylvania Railroad, will be over 900 ft. long, including the approaches, and will cost about $90,000.

The Harrisburg Bridge Co. has asked bids for a steel bridge over the Susquehanna at Market street, and it is said that the contract will be let in August. (June 6, p. 420.)

Hereford, Pa.—The County Commissioners, with surveyors, inspected on July 22 the site for a new steel bridge over the Perkiomen River.

McCook, Neb.—The Commissioners of Red Willow County will receive bids for a bridge across the Republican River until noon, Aug. 5. Specifications on file in County Clerk's office, McCook. E. J. Wilcox, County Clerk.

Bids will also be received until the same date for repairing and rebuilding the bridge across the Republican River southwest of Indianola.

Mifflin, Pa.—J. C. Brown, of Bloomsburg, Pa., writes that bids will be received by the County Commissioners of Columbia County, Pa., for a steel bridge 1,296 ft. long, to be built over the Susquehanna River, at an estimated cost of about $95,000. The commissioners may be addressed at Bloomsburg.

Morristown, N. Y.—The Black Lake Fish & Game Club has instituted proceedings against the Black Lake Bridge Company, which is building a steel bridge across the upper end of Black Lake, to compel the elevation of the bridge so as not to obstruct navigation, the central span resting on a narrow island in the middle of the lake. The abutments and piers between the island and the Morristown shore are barely above high water level, while the south channel has been filled across solid

All work is stopped. If the proceedings are successful a new bridge will have to be built with a draw.

NIAGARA FALLS, ONT.—The Canadian Power Company will build a bridge in Queen Victoria Park to carry the Niagara Falls Park and River Ry. over the company's intake canal.

Plans have been prepared for a new structure to replace the Montrose bridge.

NISBET, PA.—Surveys are reported for a double-track iron bridge, which the Pennsylvania intends to build next year.

PEMBROKE, ONT.—Sealed tenders will be received by S. E. Mitchell, County Clerk of Renfrew County, Ont., until 6 p.m., August 2, for a stone bridge or a steel bridge with stone abutments over the Bonnechere River at Eganville. (June 6, p. 420.)

PETERBOROUGH, ONT.—M. A. Morrison will receive tenders for repairing the Otonabee bridge.

PINE BLUFF, ARK.—A proposition is before Jefferson County to build a free bridge across the Arkansas River at Pine Bluff with material recently taken from a Red River bridge by the Cotton Belt. The material consists of an iron bridge and draw span.

PLAYA DEL REY, CAL.—The Beach Land Co. writes that it will build either a stone or cement arch bridge at this place, plans for which have not as yet been prepared. Further particulars will be furnished later.

PLEASANTON, CAL.—According to report, plans have been adopted by the County Board of Supervisors for a concrete bridge across Arroyo del Valle Creek, north of Pleasanton. The estimated cost is $12,000.

PROVIDENCE, R. I.—Otis F. Clapp, City Engineer, writes that bids are wanted Aug. 15, for a steel bridge about 165 ft. long over the Woonasquatucket river. The estimated cost is $15,000. R. E. Smith, Commissioner of Public Works, Providence, R. I., will receive bids.

RIVERSIDE, CAL.—At a meeting of the Board of Supervisors, July 21, plans were presented for a bridge across the Santa Ana river about three miles below Temecula. The bridge will be about 180 ft. long, and specifications will be placed in the hands of County Surveyor Pierson, on Aug. 6.

RUTLEDGE, TENN.—A bridge across Holston River, to cost $80,000, is said to have been ordered by the County Court. Bids will be asked about the middle of August.

SAULT STE. MARIE, MICH.—The County Board of Supervisors is said to have granted the petition of Drummond Township for a bridge across Pottaganissing River.

SCHENECTADY, N. Y.—It is said that the Vischer's Ferry iron bridge, which was partially destroyed by freshet, last spring, will be rebuilt this fall, at an estimated cost of $12,000.

STANWIX, N. Y.—Contract has been let to David Nicholson, of Syracuse, to build a 140-ft. span bridge over the Erie Canal for the Utica & Mohawk Valley.

TELL CITY, IND.—Bids are wanted until Aug. 4, by the Board of County Commissioners, for a bridge 101 ft. long and 14 ft. wide. Albert P. Fenn, County Auditor, may be addressed.

WILLIAMSPORT, MD.—The project to build a bridge across the Potomac River at this place has been revived, and residents of Berkeley County, W. Va., and of Williamsport will petition the Boards of County Commissioners to this effect. The estimated cost is about $35,000, and it is said that plans have been prepared and a survey made.

WILLIAMSPORT, PA.—It is said that plans are being made for new bridges at Barbours Mills and at Bodines, Pa. An estimate of the kind of bridge required at each of these places is being made by Emil Swensson, of Pittsburgh.

Other Structures.

BOSTON, MASS.—Press reports state that improvements will be made to the Navy Yard which will cost $1,500,000. The area of the yard is to be increased about 28 acres when the wharves and docks have been carried out to the new line established by the Commissioners; new shops are to be built, a traveling crane operated along the water front, etc.

BUFFALO, N. Y.—Contract for four new blast furnaces for the Lackawanna Steel Co. was reported let July 24. The furnaces will be of large capacity and will cost about $1,000,000.

DANVILLE, ILL.—Contract is reported closed for new engine and car shops to be built at Danville by the Chicago & Eastern Illinois. The principal shop will be 480 x 200 ft., and the total estimated cost is $200,000.

ESTHERVILLE, IOWA.—It is said that the Chicago, Rock Island & Pacific will build a new depot, to cost about $30,000.

HATTIESBURG, MISS.—Work began July 17 on the grounds for the main shops of the Gulf & Ship Island, which are to be located here. The roundhouse will be about 300 ft. long. (Sept. 27, 1901, p. 675.)

MART, TEXAS.—An officer writes that work is in progress on new shops and roundhouses to be built at Mart for the International & Great Northern, but that full particulars are not yet available.

MERIDEN, CONN.—It is said that the Charles Parker Co. will build a new iron foundry about 60 ft. x 120 ft., on High street. Exact plans have not yet been made.

NEW YORK, N. Y.—The New York Harbor Line Board gave a hearing, July 25, to consider the application of the Dock Commissioner for the extension 200 ft. into the stream of the U. S. pierhead line on the North River, from a point opposite Canal street to a point opposite West Thirtieth street, Manhattan. The representatives of several steamship companies were present and asked for the change to permit of docking larger ships without dredging.

ST. JOHN, N. B.—Tenders will be received by D. Pottinger, General Manager Intercolonial Ry., at Moncton, N. B., until Aug. 18, for a new engine house to be built at St. John. Specifications may be seen at the Chief Engineer's office, at Moncton, and at the office of the terminal agent, at St. John.

TOLEDO, OHIO.—According to most recent advices, the new station to be erected by the Toledo Ry. & Terminal Co. will cost $300,000.

WELLAND, ONT.—It is said that the new Canadian Steel Corporation, which has completed organization with a capital stock of $18,000,000, will build a plant at this place on a site of 188 acres. The town has exempted the plant from taxation for 20 years. No further plans are available at present.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvi.)

Central Association of Railroad Officers.

This association, at its annual meeting, at Put-in-Bay, Ohio, July 22 and 23, elected the following officers: President, D. S. Sutherland (M. C.), Detroit; First Vice-President, C. A. Paquette (C., C., C. & St. L.), Indianapolis; Second Vice-President, J. B. Flanders (Cin. Nor.), Van Wert, Ohio; Secretary and Treasurer, O. G. Fetter, Cincinnati. A paper read at the meeting by Mr. Josselyn was published in the *Railroad Gazette*, last week.

PERSONAL.

—We think that it may now be said positively that Mr. Kendrick will not leave the Atchison to accept the place with the Westinghouse Companies, concerning which there has been a good deal of talk the last two months.

—Mr. William A. Foster, at one time Superintendent of Machinery of the Fall Brook, died July 23, aged 67 years. He was born in Brattleboro, Vt., and started his railroad service on the Vermont & Massachusetts. In 1873 he became Assistant Superintendent of Motive Power of the Fitchburg, acting 18 months as Superintendent of Motive Power. From 1885 until 1899 Mr. Foster was Superintendent of Machinery of the Fall Brook Coal Company, now known as the Fall Brook Railway Company.

—Mr. P. A. Mitchell, the new Superintendent of Construction of the Des Moines, Iowa Falls & Northern, was formerly General Manager of the Duluth Transfer Railway. Mr. Mitchell was born at Du Quoin, Ill., in 1868, and began his railroad service as a clerk on the Chicago, Rock Island & Pacific in 1883. He remained with this company for two years, when he resigned to go with the Illinois Central. In 1888 he returned to the Rock Island. In 1892 he went with the Duluth Transfer as Superintendent, later assuming the General Managership, which position he retained until July 1, this year, when he resigned to go with the Des Moines, Iowa Falls & Northern.

—Mr. W. B. Glardon, who since June 15, last, has been Superintendent of Telegraph of the Denver & Rio Grande, was born at Cincinnati in 1862 and entered railroad service in 1882 as a brakeman on the Wabash. He left this position the latter part of that year to take a position with the Central Union Telephone Company at Toledo, Ohio, who was at that time building part of its exchange system in a number of cities and towns in the middle west. In 1883 he entered the service of the Old Bankers and Merchants Telegraph Company, now the Postal Telegraph Company, as Assistant Foreman. The following year (1884) he returned to the Wabash as a foreman and during the summer of '84 was located at Litchfield, Ill., as division lineman. He remained with this company until the fall of 1897, when he was appointed General Foreman of the Grand Trunk at Battle Creek, Mich., and remained with this company until March, this year ,when he took a similar position on the Denver & Rio Grande, from which position he has just been promoted as above.

ELECTIONS AND APPOINTMENTS.

Au Sable & Northwestern.—W. M. Kummer, Master Mechanic, with headquarters at Au Sable, Mich., has resigned. (See Detroit & Charlevoix.)

Blackwell, Enid & Southwestern.—C. H. Anderson has been appointed Superintendent, with headquarters at Cordell, Okla. T.

Chicago & North Western.—S. M. Braden, heretofore Superintendent of the Iowa & Minnesota Division, has been appointed Superintendent of the Galena Division, with headquarters at Chicago, Ill., succeeding W. E. Morse.

W. E. Morse, Division Superintendent, with headquarters at Chicago, Ill., has resigned. (See St. Louis, Kansas City & Colorado.)

Chicago, Rock Island & Pacific.—H. F. White, Chief Engineer of the Burlington, Cedar Rapids & Northern, has been appointed Engineer of Maintenance of Way of the C., R. I. & P. F. S. Spafard has been appointed Superintendent of Telegraph.

L. M. Allen, heretofore Assistant General Passenger Agent, has been appointed General Passenger Agent, with headquarters at Chicago, Ill. W. T. Wolff has been appointed Assistant to the General Manager.

Chicago, Rock Island & Texas.—W. B. Leeds has been elected President, succeeding H. A. Parker, resigned.

Chicago Short Line.—The officers of this company are: President, C. W. French; Vice-President, A. A. Purman; Secretary, V. A. Dehnel; Treasurer, Hugh A. Holmes; Auditor, W. W. Pope; General Counsel, James P. Wilson; and A. W. Harned, Superintendent of Motive Power.

Detroit & Charlevoix.—W. M. Kummer, heretofore Master Mechanic of the Au Sable & Northwestern, has been appointed Master Mechanic of the D. & C., with headquarters at Deward, Mich.

Duluth, Missabe & Northern.—W. A. McGonagle has been appointed Assistant to the President.

Mexican Central.—T. Mason has been appointed Assistant General Superintendent.

Michigan Central.—F. P. MacDonald, Division Superintendent, with headquarters at Jackson, Mich., has resigned.

Milwaukee, Benton Harbor & Columbus.—W. P. Squier has been appointed Auditor, succeeding J. W. Johnston, resigned. E. C. Richmond has been appointed Assistant Auditor.

New York, New Haven & Hartford.—The jurisdiction of J. P. Hopson, Superintendent of the Berkshire Division, has been extended over the Naugatuck Division, with headquarters at New Haven, effective August 1.

Norfolk & Western.—S. R. Payne, Assistant Division Superintendent, with headquarters at Bluefield, W. Va., has resigned.

Northwestern R. R. of South Carolina.—W. B. Wilson has been appointed General Superintendent.

Oregon Short Line.—H. W. Henderson has been appointed Division Superintendent, with headquarters at Salt Lake City, Utah, succeeding J. H. Young, resigned. (See Rio Grande Western.)

Rio Grande.—J. Celaya, General Manager, has resigned, and the duties of that office will be assumed by President A. Celaya.

Rio Grande Western.—J. H. Young, heretofore Division Superintendent of the Oregon Short Line, has been appointed General Superintendent of the R. G. W., with headquarters at Salt Lake City, Utah, succeeding A. E. Welby, resigned.

St. Louis, Kansas City & Colorado.—George L. Sands, Vice-President and General Manager, with headquarters at St. Louis, Mo., has resigned. W. E. Morse, heretofore Division Superintendent of the Chicago & North Western, has been appointed General Superintendent of the St. L., K. C. & C., with headquarters at St. Louis.

St. Louis, Memphis & Southeastern.—J. G. Rinker has been appointed General Foreman of Bridges and Buildings, with headquarters at Cape Girardeau, Mo. The position of Superintendent of Bridges and Buildings has been abolished.

Searcy & Des Arc.—H. C. Brown has been appointed General Manager, with headquarters at Searcy, Ark., succeeding C. E. Gibbs, resigned.

Southern Pacific.—W. R. Russell has been appointed Master Mechanic of the Western Division, with headquarters at Oakland, Cal. R. S. Goble has been appointed Master Mechanic, of the Los Angeles Division, with headquarters at Los Angeles, Cal.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ARKANSAS & CHOCTAW (ST. LOUIS & SAN FRANCISCO).—According to most recent advices, this line is to be extended west to Ardmore, Ind. T., where connection will be made with the Gulf, Colorado & Sante Fe. The line will also be built to Texarkana and Hope, Ark., and will be about 225 miles long. A branch of the St. Louis & San Francisco will also be built to Sulphur Springs, Ind. T. (See under St. Louis & San Francisco, April 18, p. 296.)

ARKANSAS, SPRINGFIELD & NORTH WESTERN.—A company with the above title has been formed in Missouri to build track from a point at or near Jefferson City through Missouri to Seligman in Barry County, near the Kansas State line, a distance of about 120 miles, through the Counties of Cole, Miller, Camden, Dallas, Polk, Greene, Christian, Taney and Stone. The directors are C. H. Varnon, Henry E. Folloman and others, of Kansas City.

AUTAUGA.—Surveys are reported for this projected line from Autaugaville, Ala., to a point near Booth Station on the Mobile & Ohio, eight miles distant. The company filed notice of incorporation on May 4th, and was chartered by the Secretary of State of Alabama, July 24. S. M. Dinkins, of Montgomery, has been elected President, and M. M. Smith, of Autaugaville, Vice-President.

ATLANTIC CITY & SUBURBAN TRACTION.—This company was incorporated in New Jersey July 19, to build a system of electric lines in the vicinity of Atlantic City, which will total about 15 miles; running through Pleasantville, Absecon, and other points. Edward R. Sponster, of Harrisburg, is President.

BALTIMORE & OHIO.—It is said that the Pittsburgh, Cleveland & Toledo line will be rebuilt between New Castle Junction, Pa., and Akron, Ohio, 78 miles, at an estimated cost of $4,000,000. The work is to include reduction of curvature and grades, double tracking between New Castle Junction and Struthers (14 miles), and a new yard at New Castle Junction.

BLAIRSVILLE & DERRY STREET.—This company was chartered in Pennsylvania July 23, to build an electric railroad from Blairsville, Indiana County, Pa., to Derry, in Westmoreland County, a distance of 10 miles. Thomas C. Brown, Pa., is President.

CANADIAN PACIFIC.—This company will lay 80-lb. rails on 38 miles of the Ontario & Quebec Division, between Toronto and Smith's Falls, Ont.

CAROLINA & WESTERN.—This company was granted permission by the Secretary of State of South Carolina, July 18, to build a railroad from the line of the Charleston & Western Carolina to Tillman, on the Carolina Midland, a distance of about 25 miles. The incorporators are W. F. Cummings, of Hampton, S. C., and others.

CHERRYVALE, OKLAHOMA & TEXAS.—Charter was granted this company at Guthrie, July 21, to build from Cherryvale, Kan., through Independence and Caney, Kan., and the Cherokee, Osage and Ponca Indian reservations, to Perry, Okla. T., where one line will be built to El Paso, Texas, and another to Paris, Texas, via Pawhuskie, Okla. T. The total distance which is projected is about 900 miles. Independence and Perry are the chief places of business.

CHICAGO, ROCK ISLAND & PACIFIC.—Surveys have been completed for a connecting line from Olivette, near St. Louis, Mo., to Ferguson, six miles distant, on the Wabash.

DALLAS, CLEBURNE & SOUTH WESTERN.—Work was begun July 15 on a new line between Cleburne and Dallas, 50 miles, for which contract was recently reported let to Daugherty & Davis, of Joplin, Mo. Work began simultaneously at each end of the line, and contract provides for its completion in three months. (July 18, p. 579.)

DENVER, NORTHWESTERN & PACIFIC.—This is the correct name of the company referred to in our issue of July 25, p. 600, as the Denver, Northeastern & Pacific. Articles of incorporation were filed July 18.

DETROIT SOUTHERN.—Contract is reported let for a section of road 18 miles long between Bloom Furnace and Ironton, Ohio, forming a link in the through line from Detroit to the Ohio River. (July 4, p. 543.)

EASTERN OF ALABAMA.—Contract is reported let to the Donaldson Construction Co., of Birmingham, to build this road from Talladega to Pyriton, Ala., 25 miles. It is in the interest of the Louisville & Nashville. P. H. Smith, of Talladega, is President. (July 11, p. 561.)

EASTON & WASHINGTON TRACTION.—This company filed articles of incorporation in New Jersey July 20, with a capital stock of $1,000,000, with the purpose of building a number of electric lines in the vicinity of Easton, N. J. According to the plans of the projectors the road when completed will serve a population of over 1,000,000.

HOBOKEN MANUFACTURERS. — Incorporation was granted this company in New Jersey July 22, with a capital stock of $5,000,000, to build a short road for the transportation of freight between Park avenue, near Fourteenth street, Hoboken, to a point in Jersey City near the south line of Hoboken avenue, connecting with the Hoboken Railroad Warehouse & Steamship Connecting Company on the north, and with the Delaware, Lackawanna & Western on the south. James A. Brown, Robert M. Dickinson and others, of Hoboken and elsewhere, are interested.

HOCKING VALLEY.—Work is reported begun on a second track between Lancaster and Sugar Grove, Ohio, a distance of seven miles.

HOUSTON & TEXAS CENTRAL.—According to most recent advices, the extension from Burnet to Lampasas, Texas, 24 miles, will be completed by Aug. 31. (March 7, p. 169.)

INTERCOLONIAL.—An inspection of this road has just been made by Hon. J. G. Blair, Minister of Railways, who is quoted as saying that the Government contemplates a change in some parts of the line between the Strait of Canso and Amherst, N. S. The plan is to change the location of the road so as to connect with the Canso Bridge at Cape Porcupine and then to run along the gulf coast to Harbour au Bouche and Antigonish, and from thence to Pictou, N. S., and thence over a short line to Pugwash, at which place the link will be built to Amherst. The proposed change will eliminate some heavy grades.

Bids will be received until Aug. 12 by D. Pottinger, Gen. Mgr., Moncton, N. B., for grading and track laying on the branch from Riviere Ouelle, Kamouraska County, to St. Denis Wharf, on the St. Lawrence, six miles. Plans and specifications may be obtained at the office of the Chief Engineer, Moncton, and at the Station Master's office, Riviere Ouelle, N. B. (July 4, p. 543.)

IRON RAILWAY.—An amendment to the charter has been made to permit of building a branch from a point on the line near Lawrence, in Lawrence County, Ohio, to a connection with the Detroit Southern at a point near Jackson, in Jackson County, 26 miles north. The directors of the road are: Samuel Hunt, President; C. C. Clarke, R. T. McKnight, A. W. Hurd, E. R. Dick and F. J. Lisman.

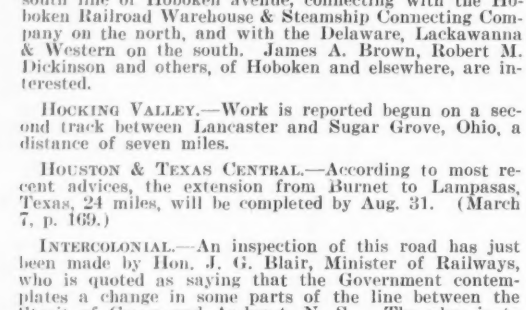
JERSEY CENTRAL TRACTION.—Surveys were filed at Trenton by this company July 22 for an electric line between Keyport and Red Bank, 17 miles. The road will cross the Chingarora Creek near Keyport and parallel the Central Railroad of New Jersey to a point near Keansburg, from which point it goes south by private right-of-way.

LANCASTER & YORK FURNACE STREET.—This company was chartered in Pennsylvania, July 23, with a capital of $225,000, to build an electric line from Millersville to York Furnace, on the Susquehanna, a distance of 10 miles, forming a connecting link in the lines which will run before long between Lancaster and York, Pa.

LEHIGH VALLEY.—It is said that options are being secured between Geneva and Syracuse, N. Y., with a view to an extension between these points. Part of the proposed line, between Geneva and Seneca Falls, was built some time ago, and it is now proposed to build east from Seneca Falls. The distance from Geneva to Syracuse is about 40 miles.

LONG ISLAND.—A number of land transfers were recorded in the clerk's office of Queens County, July 17, involving a total value of nearly three million dollars worth of property, and, it is said, furnishing all necessary land for the terminal of the proposed tunnel under the East River.

MEXICAN NATIONAL.—The accompanying cut furnished by an officer shows the present line of the Mexican National in the vicinity of the City of Mexico, and also the new cut-off to be built from Huehuetoca to Soria. The



present line, narrow gage, from the City of Mexico to Laredo on the Rio Grande River, is 841 miles long. When the standard gage and the new cut-off are completed there will be a standard gage line between these points about 792 miles long.

MICHIGAN ROADS.—The Commissioner of Railroads has approved an undergrade crossing of the Toledo, Adrian & Jackson Electric with the tracks of the Wabash, just east of the city limits, Adrian.

MILLEN & SOUTHWESTERN.—An officer confirms the report that the company contemplates letting contracts for 55 or 60 miles of new line to be built as an extension to the road at present in operation. When completed, the entire mileage will be about 90. Frank R. Durden, Monte, Ga., is General Manager. (July 11, p. 562.)

MISSISSIPPI ROADS.—A short road is being projected by James Smith, of Meridian, Miss., to run from a connection with the Alabama & Vicksburg to a place near Chunkey, Miss., reaching timber and mineral lands.

MUNCIE, HARTFORD CITY & FORT WAYNE (ELECTRIC).—Notice of an increase in capital stock from $100,000 to $1,000,000 has been given. It is proposed to build from Muncie to Hartford City and Bluffton, and eventually to Ft. Wayne. The distance from Muncie to Bluffton is about 100 miles. The company was incorporated in July, 1901.

NASHVILLE, CHATTANOOGA & ST. LOUIS.—Surveys are reported in progress between Lebanon and Smithville, Tenn., 25 miles, in Dekalb County. Nothing is known as to the present likelihood of building.

NEW RIVER COAL.—This company filed articles of incorporation in Kentucky, July 22, to build a railroad 17 miles long from a point on the Cincinnati Southern four miles south of Pine Knot, Ky., into timber and mineral lands owned by it in Scott County, Tenn., just across the line from Kentucky. The office of the company will be at Danville, Ky.

NEW YORK & BERKSHIRE STREET.—The organization of this company was perfected at a meeting in Great Barrington, Mass., July 19, at which the charter granted by the Legislature was accepted. It is proposed to build from Copake, N. Y., to the Connecticut River at Springfield, Mass., a distance of about 65 miles. The road may be operated by any power except steam and is given the right to carry freight. R. C. Taft, South Egremont, Mass., was elected President, and O. C. Bidwell, of Great Barrington, Mass., Consulting Engineer.

NORTHWESTERN TEXAS.—Charter for this company was filed at Austin, Texas, July 19. It is proposed to build from a point on the Red River, Brown County, southeast to the town of Cassetta, Cass County, 17 miles. The chief place of business is Red Water, Brown County, and the directors are G. Eunez, J. E. Kirby, Hiram Glass, and others, of Texarkana and elsewhere.

NOVA SCOTIA ROADS.—The contract to build a road from Middleton to Victoria Beach, N. S., a distance of 45 miles, has been let to M. J. O'Brien, of Halifax, N. S.

PITTSBURGH & SOUTHEASTERN.—Charter was issued to this company July 22, in Pennsylvania, to build a steam railroad from a point near South Twenty-third street in the City of Pittsburgh, to a point near the mouth of Streets Run in the Borough of Hayes, Allegheny County, Pa., 2½ miles. John B. McAdoo, of Homestead, Pa., is President.

QUEBEC & NEW BRUNSWICK.—An officer writes in regard to the report that this company has been reorganized, that the reorganization took place on June 20, at which time the Hon. John Costigan was elected President, and Hon. A. Turgrow, Secretary. It is proposed to build from a connection of the present terminus of the St. Francis Branch of the Temiscouata Railroad with the Chaudiere Junction, near the new bridge across the St. Lawrence a few miles above Quebec, a total distance of 130 miles. The proposed railroad will run largely through a timber and agricultural country, and has been partially surveyed. It has the usual subsidy from the Dominion Government on about half its length, also a subsidy from the New Brunswick Government for that portion which is within that province, and a land grant from the Quebec Government is expected, for the Quebec portion of the line. The company will not be in condition to consider offers for building at present, but work has begun at the terminus of the St. Francis Branch of the Temiscouata on a short branch about four miles long, which it is expected will be operated before November. The character of the work is ordinary, with no steel bridges, trestles or tunnels. (Feb. 28, p. 154.)

RIO GRANDE WESTERN.—This company, during the last 18 months, has been giving special attention to bridge building and improvements, having put in about 100 new steel bridges between Grand Junction and Ogden, displacing all wooden bridges with steel structures placed on concrete piers with spans varying from 16 to 114 ft. About 23 miles south of Salt Lake City, at what is known as the Jordan Narrows, a double concrete arch has been erected. About 200 ft. to the right of the arch is a 16 ft. elliptical arch over the Jordan canal. This arch is re-enforced by channel irons which are embedded in the concrete. These line changes are being made for the purpose of reducing the maximum grade from 1 per cent. to .65 per cent. through Jordan Narrows and for reducing the curvature. A retaining wall has been built along the Salt Lake City canal, and is about 13 ft. high and 160 ft. long. Near this wall there is a 24 ft. skew arch over the Jordan River and immediately to the south of that is a 16 ft. skew arch over the South Jordan Canal. These are all part of the new structures recently built. A number of minor concrete arches have been built. The road is now building 12 steel bridges on the Scofield branch, where the increased tonnage of coal from the Scofield and Winter Headquarters mines requires heavy bridges. Here about 2,500 cu. yds. of concrete will be used. All work has been done under the immediate charge of E. J. Yard, Chief Engineer for the road, assisted by Division Engineer F. E. Baxter.

ST. LOUIS & SAN FRANCISCO.—See Arkansas & Choctaw, above.

ST. LOUIS, KANSAS CITY & COLORADO.—Contract to build this road from Versailles to the northern limits of Warrensburg, Mo., a distance of about 60 miles, is reported let to a firm in Minneapolis. Surveys on this line were made last spring, but nothing further was done.

SALT LAKE & SUBURBAN.—Franchise for about 40 miles of railroad in the city of Salt Lake and country adjacent has been asked. The application seeks a blanket franchise covering seven routes, of which two are main lines. The longest of these runs on East Third street and Upper County Road to Big Cottonwood Canyon, 12 miles.

SOUTHERN INDIANA.—This company, operating between Terre Haute and Seymour, Ind., 122 miles, filed with the Secretary of State of Indiana, July 14, notice of increase of capital stock from $1,500,000 to $3,000,000. At a meeting of stockholders on July 11 it was decided to build branch lines in Lawrence, Green and Sullivan Counties, Indiana, no one of which will be more than 50 miles long. Further details are not at present obtainable. John R. Walsh is President.

SUMMIT COUNTY.—This company was incorporated in Ohio July 16 to build a steam railroad connecting the Akron & New Castle at Akron with the Cleveland Division of the Wheeling & Lake Erie at Mogadore, in Portage County, Ohio, a distance of seven miles. W. W. Pope, Frank E. Ream and others, of Columbus, Ohio, are the incorporators.

TALLULAH FALLS.—An amendment to the charter was granted July 19 providing for an increase in capital stock from $30,000 to $500,000. Contract for the first part of a new line from Tallulah Falls, Ga., to Franklin, N. C., 38 miles, was let last March. (March 21, p. 218.)

TEXAS & OKLAHOMA (MISSOURI, KANSAS & TEXAS).—Surveys were reported begun July 16 for a line from Guthrie, Okla. T., to Coalgate, Ind. T., where a connection will be made with the Denison & Washita Valley. (July 11, p. 562.)

TOLEDO, ANGOLA & WESTERN.—This company was incorporated in Ohio July 15 to build west from Toledo to the Indiana line, through Lucas, Fulton and Williams Counties, a distance of about 65 miles in an air line. It is the intention of the incorporators to eventually extend the line into Indiana, but the route beyond the Ohio line is not described in the Ohio charter. Charles F. Chapman, Jr., Harry W. Lloyd and others, of Toledo, are the incorporators.

TOLEDO, MIAMI & SOUTHERN.—This company was incorporated in Ohio July 18 to build a steam railroad from Toledo through Lucas, Wood, Henry, Putnam, Allen, Anglaize, Mercer and Darke Counties to Union City, Ohio, on the Indiana boundary in Darke County. The total distance is about 150 miles. A. L. Irish, J. P. McAfee, and others, of Toledo, are the incorporators.

WESTERN OF ALABAMA.—Surveys are reported for a new road from Soapstone down to the south side of the Alabama River to a new bridge now being built opposite what is known as the Franklin Warehouse, a distance of seven miles. J. W. Gannon, Montgomery, Ala., is the engineer in charge.

WEST POINT & NORTHERN.—See under West Point Coal and Coke.

WEST POINT COAL & COKE.—Application has been made in Ohio for incorporation of a company under the above title which proposes to develop coal lands in Madison Township near West Point, Ohio. Application has also been made for a railroad, five miles long, to be built under the name of the West Point & Northern, and run from West Point to Lisbon. It is said that contracts for the latter have already been let. J. L. Francis, of East Liverpool, Ohio, may be addressed.

YAKIMA VALLEY CENTRAL (ELECTRIC).—Surveys are reported made for an electric line about 100 miles long, to run from North Yakima, Wash., to Sunnyside, and the adjacent country. It is planned to build a power house at Horse Shoe Bend, on the Natches River, and it will be necessary to bridge the Yakima River. Thirteen thousand dollars, it is said, has been already subscribed by towns interested, and more has been promised.

GENERAL RAILROAD NEWS.

ATCHISON, TOPEKA & SANTA FE.—The Santa Fe Pacific and San Francisco & Joaquin Valley roads, formerly controlled by stock ownership, have been taken over as a part of the system. The Santa Fe Pacific operates 875 miles; the San Francisco & Joaquin Valley, 306, making a total of 1,181 miles added to the road on which the general mortgage of 1895 is a direct lien.

BUFFALO, ROCHESTER & PITTSBURGH.—Shareholders of record August 1 are offered the privilege of subscribing at par between Aug. 8 and Aug. 15 to new common stock, to the extent of 10 per cent. of their holdings. The amount to be issued is $1,300,000, which will pay for a new branch from Williams Crossing, near Punxsutawney, to McKees, Indiana County, Pa., to reach coal lands. The estimated cost of this improvement is $800,000, leaving $500,000 for future additions and betterments. There will be $8,300,000 common stock outstanding, when the new common has been issued, and $700,000 will be left still available. The new stock will participate in dividends after Feb. 16, 1903.

CHICAGO & SOUTHEASTERN.—General mortgage gold bonds to the extent of $450,000 were sold at auction by Adrian H. Muller & Son, on July 23, for $100, per $1,000 bond. The road extends from Muncie to Brazil, Ind., 127 miles, and was organized in 1891 as successor to the Midland Ry. Benjamin Simpson, Brazil, Ind., was confirmed as receiver in June. The bonds are due in 1922; $400,000 of them have July, 1892, coupons on, and the rest have July, 1893, coupons. Information regarding the operations of the road is not available; the rolling stock consists of 11 locomotives and 226 cars.

CHICAGO, ROCK ISLAND & PACIFIC.—Announcement is made that the Shawnee, Red Fork & Coalgate, which was incorporated in Oklahoma, May 9, 1901, to build from Red Fork, Ind. T., to Shawnee, Okla. T., a distance of about 90 miles, has been taken over by the Chicago, Rock Island & Pacific.

LITTLE FALLS & DOLGEVILLE.—This property was sold at foreclosure on July 24, to Michael H. Cardozo, of New York, representing the bondholders, for $260,000. The company holds $250,000 first mortgage bonds, and operates a standard gage road 10 miles long between the points named. It was placed in the hands of a receiver on May 31, 1899.

MANISTIQUE, MARQUETTE & NORTHERN.—The Union Trust Co., of Detroit, is offering $500,000 of the company's $1,500,000 first mortgage 5s, due 1952. The road extends from South Manistique to Shingleton, Mich., 40 miles, with a branch 13 miles long, and spurs and side tracks bring the total mileage to about 75. A car ferry is to be operated from Manistique to Northport, connecting with the Traverse City, Leelanau & Manistique, which connects with the Grand Rapids & Indiana. The authorized bonds are applicable as follows: To purchase existing railroad and terminal property, $500,000; for betterments, $100,000; for car ferry, etc., $400,000; reserved to build an additional car ferry, when required, and for further betterments, $500,000. The road earned $173,861 gross, for the year ending May 1, 1902, and shows $53,783 surplus under present conditions. Contract has already been let for one of the car ferries, which is to be delivered next April. The new route, via ferry, will be about 85 miles shorter than any in existence at present.

NEW ORLEANS & NORTHEASTERN.—A new mortgage to the New York Security & Trust Co., trustee, has been filed, to secure $1,500,000 4½ per cent. gold income bonds due in 1952. This was authorized at a meeting of the stockholders last March, as part of a plan to retire outstanding obligations and provide for betterments. (April 4, p. 258.)

ST. JOSEPH RAILWAY LIGHT, HEAT & POWER CO.—This electric property in the city of St. Joseph, Mo., which includes 40 miles of electric line, has, it is said, been sold by the Harriman Syndicate to the E. W. Clark Co. and J. & W. Seligman, of New York. The price is said to have been $3,500,000, and it is said that extensions of the traction system are to be built. W. T. Van Brunt, of St. Joseph, Mo., is President and General Manager.

THE INTERNATIONAL & GREAT NORTHERN has purchased the Austin Dam & Suburban Railroad. This line is about five miles long and runs from a point on the Colorado River three miles from the city into and through the heart of the business district. It will be used as an addition to the terminal facilities of the International & Great Northern at Austin, Texas.

THE MISSOURI, KANSAS & TEXAS is said to be negotiating with the International & Great Northern for the use of the latter's track between Taylor, Texas and San Marcos, a distance of about 60 miles, thereby saving the building of the proposed "cut-off" line by the former road. The International & Great Northern is endeavoring to form an arrangement with the Missouri, Kansas & Texas for the use of the latter's track between Italy, Texas, and Dallas, which, if it becomes effective, will save the building of the proposed branch line into Dallas by the former line from a point on its Fort Worth Division, now building.